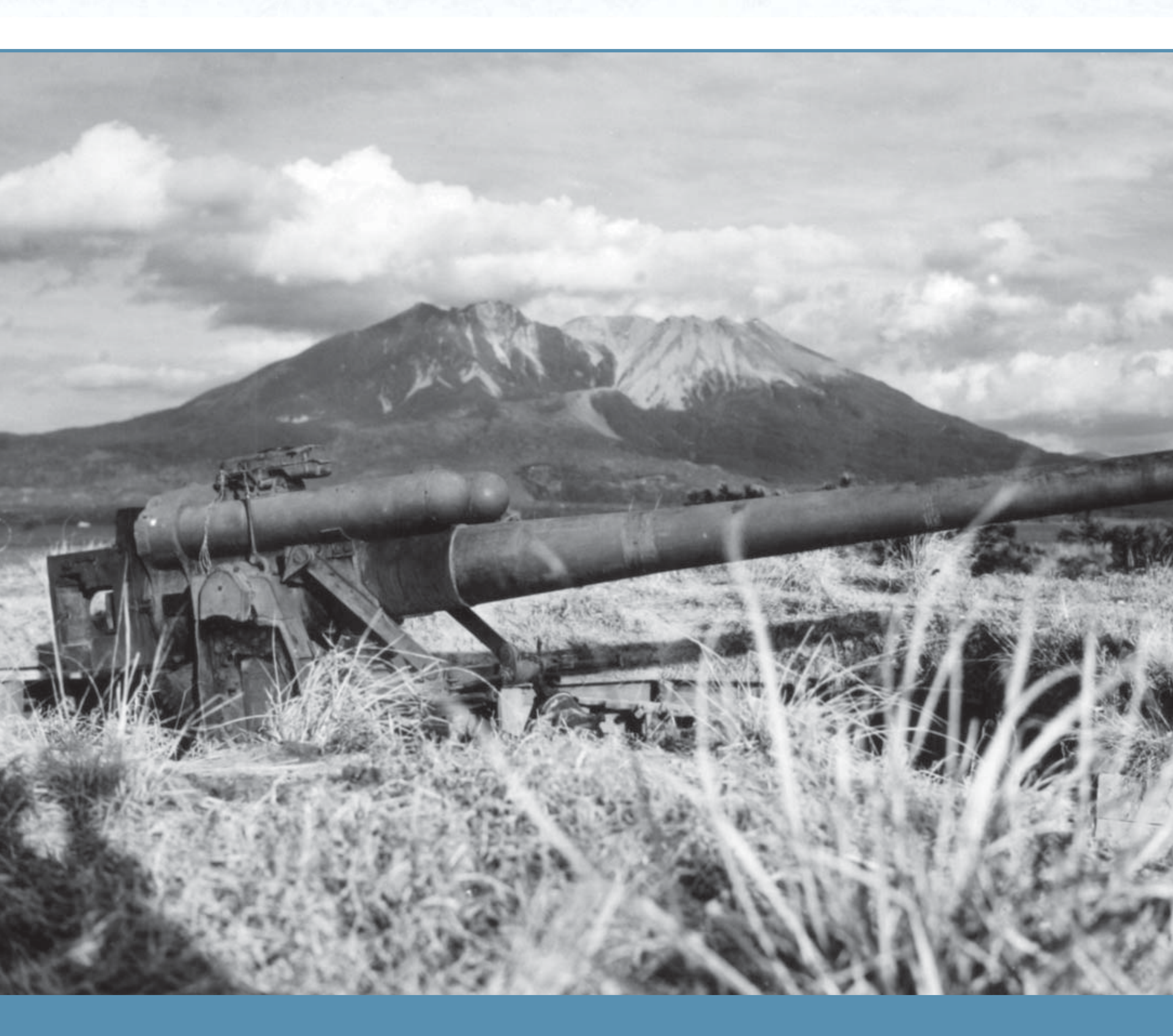
DEFENSE OF JAPAN 1945

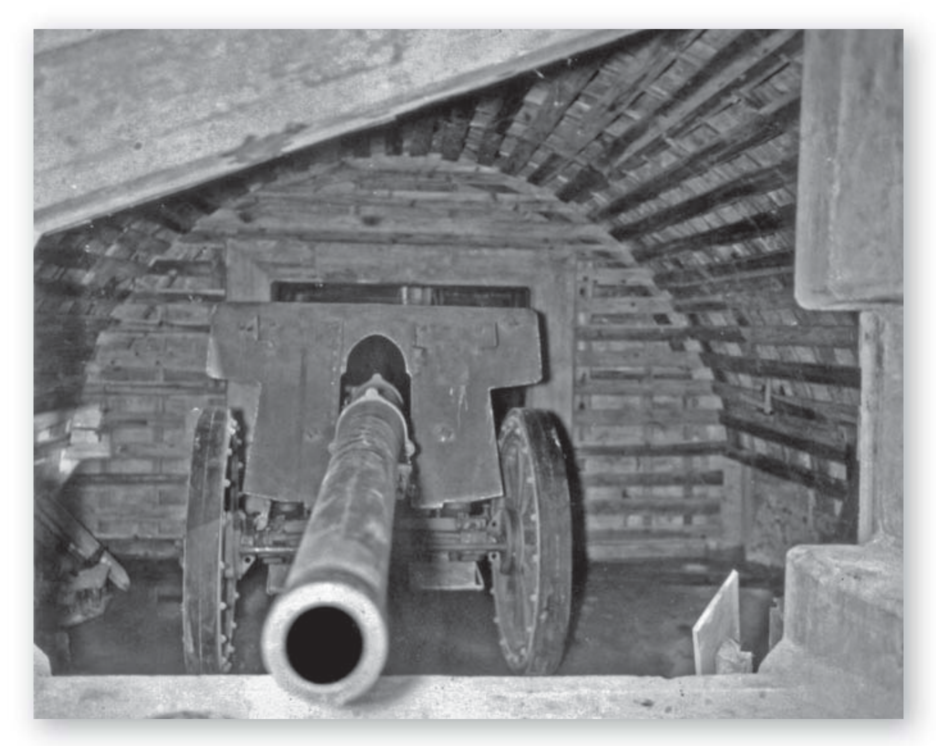


STEVEN J ZALOGA ILLUSTRATED BY STEVE NOON



FORTRESS • 99

DEFENSE OF JAPAN 1945



STEVEN J ZALOGA

ILLUSTRATED BY STEVE NOON

Series editor Marcus Cowper

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THE FORTRESS STUDY GROUP (FSG)

The object of the FSG is to advance the education of the public in the study of all aspects of fortifications and their armaments, especially works constructed to mount or resist artillery. The FSG holds an annual conference in September over a long weekend with visits and evening lectures, an annual tour abroad lasting about eight days, and an annual Members' Day.

The FSG journal *FORT* is published annually, and its newsletter *Casemate* is published three times a year. Membership is international. For further details, please contact:
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The History of Fortification Study Center (HFSC) is an international scientific research organization that aims to unite specialists in the history of military architecture from antiquity to the 20th century (including historians, art historians, archeologists, architects and those with a military background). The center has its own scientific council, which is made up of authoritative experts who have made an important contribution to the study of fortification.

The HFSC's activities involve organizing conferences, launching research expeditions to study monuments of defensive architecture, contributing to the preservation of such monuments, arranging lectures and special courses in the history of fortification and producing published works such as the refereed academic journal *Questions of the History of Fortification*, monographs and books on the history of fortification. It also holds a competition for the best publication of the year devoted to the history of fortification.

The headquarters of the HFSC is in Moscow, Russia, but the center is active in the international arena and both scholars and amateurs from all countries are welcome to join. More detailed information about the HFSC and its activities can be found on the website: www.hfsc.3dn.ru
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DEFENSE OF JAPAN 1945

INTRODUCTION

By the beginning of 1945, Imperial Japan was on the edge of the abyss. After an initial surge of victories in 1941–42, the Japanese armed forces had suffered an unbroken string of defeats. In late 1944, the Imperial Japanese Navy (IJN) had seen most of its remaining major warships sunk in the battles of Leyte Gulf and the Philippine Sea. The Imperial Japanese Army (IJA), while still substantial in size, had been chronically unable to resist American military power in the Pacific campaigns of 1943–44.

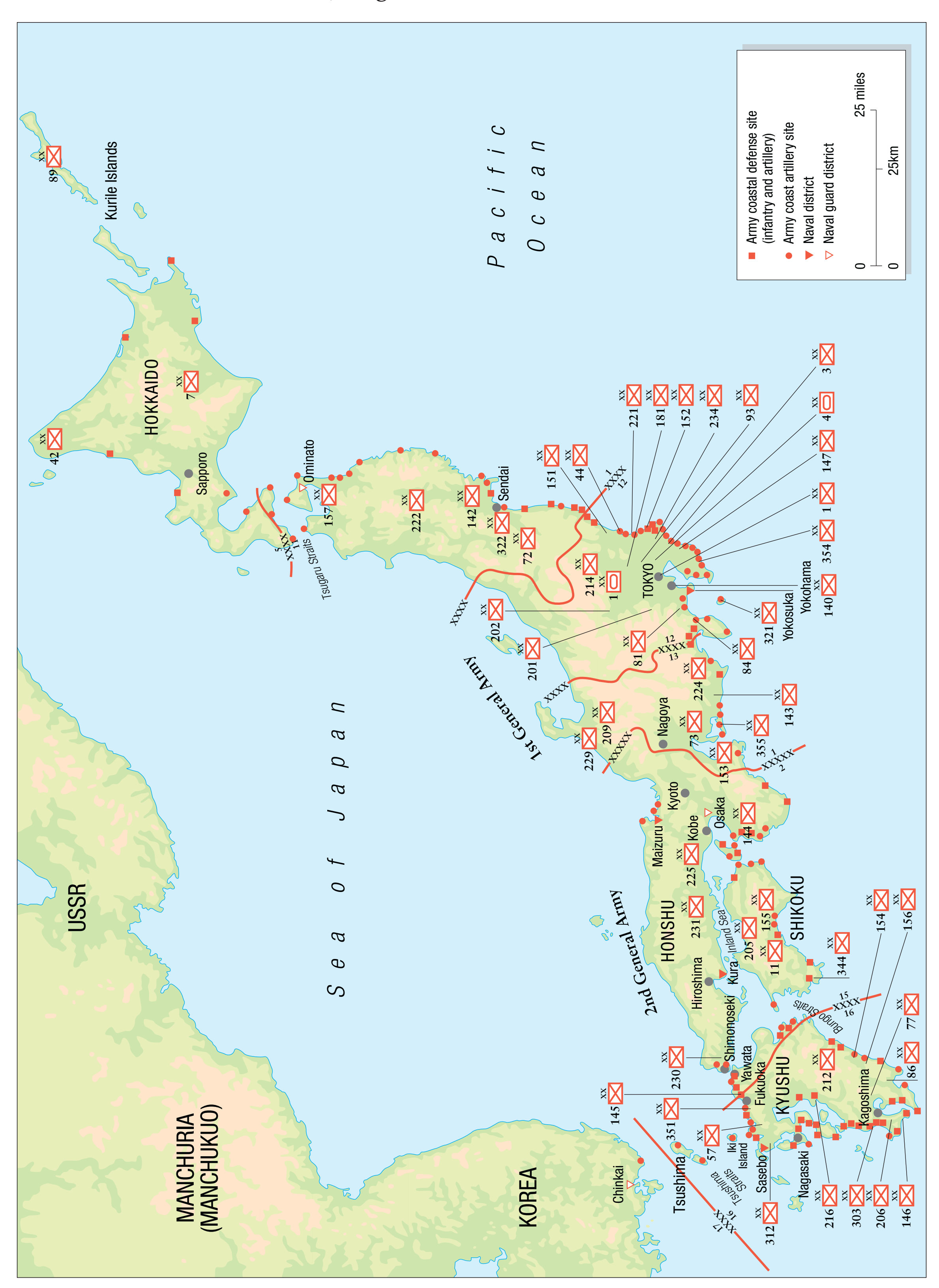
Japan was unprepared for the inevitable final battle for the Home Islands (Hokkaido, Honshu, Shikoku, and Kyushu). Since the victory over Russia in the 1904–05 conflict, the Japanese art of war had favored offensive operations, and was disdainful of defensive preparations. War would be conducted on enemy territory and so protective measures in Japan itself were unnecessary. Well into 1944, Japanese military leaders promoted scheme after scheme to stave off defeat, procrastinating in taking defensive measures in Japan itself. By the latter half of 1944, it was too late to correct years of neglect.

By early 1945 there were two primary threats to the Home Islands: heavy-bomber attack and amphibious invasion. Starting in June 1944, B-29 bombers had begun attacks from forward bases in China, but these attacks at first were ineffective. The threat to Japan intensified in November when the XXI Bomber Command started B-29 attacks from the recently captured



The fighting in the Pacific gave Japanese forces a wealth of experience in the fortification of coastal gun positions, like this Navy 15cm gun casemate built on Point McKinley on Luzon in the Philippines. However, dwindling resources in the Home Islands in 1945 prevented the extensive use of fortifications in the efforts to prepare for the final battle. (NARA)

Defense of the Home Islands, August 1945



Marianas. Japanese antiaircraft artillery and interceptor fighters were unable to seriously contest the bombing raids because of obsolete equipment and a poor early warning system. The inner ring of Japanese defense was decisively penetrated in early 1945 with US amphibious operations against the Philippines, Iwo Jima, and Okinawa.

In January 1945, the Emperor approved a directive that finally admitted that the sacred Japanese Home Islands would be the setting for the final decisive battle of the war. This strategic shift culminated in the Ketsu-Go plan (Decisive Operation plan), which was activated in early April 1945. This plan outlined the steps needed to defend the Home Islands against the anticipated US amphibious invasion. The main defensive options focused on the southern island of Kyushu and on the Kanto Plain around Tokyo.

Ketsu-Go initiated an intense acceleration of Japanese efforts to build up its coastal-defense and air-defense forces, as well as to reinforce the garrisons on the Home Islands. Prior to 1945, Japanese coastal defense efforts were modest and focused primarily on the defense of key ports and straits against enemy naval action. Ketsu-Go shifted the orientation towards the anti-invasion mission, which required much more extensive defenses. Aware of the failure of Germany's Atlantikwall fortification effort, the Japanese were skeptical of the value of heavy beach fortifications. From their own experience against US amphibious operations in the previous two years of war, they were convinced that the only plausible defense was the use of "special attack" kamikaze formations to cause severe attrition of US transport shipping before the invasion began. Japan began husbanding its resources for the final battle, even limiting the number of aircraft devoted to air defense in spite of the horrible devastation wrought by the B-29 bombers.

In the end, the belated and half-hearted efforts at air defense left Japan vulnerable to a rain of ruin from American B-29 bombers. City after city was burned to the ground in horrific firebomb raids. Japanese military industry was obliterated and production fell precipitously. Aerial mines laid in Japan's inland waters sank much of the remainder of the merchant fleet and cut Japan off from vital sources of food and fuel. Japan was on the brink of starvation and economic collapse when lone B-29 bombers dropped atomic bombs on Hiroshima and Nagasaki in August 1945, avoiding the bloody prospects of the Ketsu-Go plan.

This book examines Japan's defensive preparations for the final battle in 1945. In keeping with the theme of this series, the special focus is on the infrastructure of coastal defense and air defense.

DESIGN AND DEVELOPMENT

Japanese military policy in the early 20th century was offensively oriented and aimed at extending Japan's control beyond the Home Islands and into China, Southeast Asia, and the Pacific. As a result, Japanese defensive preparations in the Home Islands were given low priority. The General Defense Command (GDC) was activated on July 12, 1941 under General (Prince) Naruhiko Higashikuni, and assigned the defense of the Home Islands as well as the immediate defense sphere that included Korea, Taiwan, and Karafuto, as well as the Bonin, Ryukyu, and Kurile Islands. The IJA in the Home Islands was organized under four district commands. In March 1944, the GDC's responsibilities were narrowed to the Home Islands. The GDC did not have direct command of units in Japan, but exercised its functions through the



LEFT
Tokyo Bay was one of the first coastal fortified zones in the late 19th century, and amongst its defenses was a battery of 15cm guns in steel cupolas located on the Futtsu peninsula opposite Yokohama. These turrets were typically armed with imported Krupp or St Chamond M1890 guns. Some were still in service in 1945 and are seen here being inspected by US troops at the beginning of the occupation. (NARA)

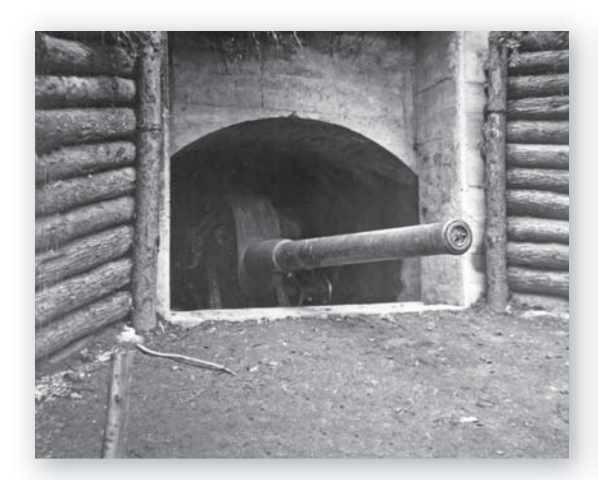
existing military district headquarters, which controlled the field armies. The IJN had an entirely separate chain of command, and there was a pathological degree of rivalry between the two combat services. In August 1943, an agreement was reached between the Army and Navy that left all of homeland defense in the hands of the Army with the exception of specified naval districts.

There was extensive reorganization of the Army in early 1945, marking a switch from peacetime administrative formations to battle formations. Two general armies, equivalent to a European army group, were formed to coordinate military operations and the four military districts were expanded to six and reorganized as area armies, equivalent to European armies.

Japanese coastal defense through 1944

The end of Japan's isolation after the visit of Commodore Perry's squadron in 1855 initiated Japan's interest in modern coastal defenses. Tokyo Bay was the first to see the construction of harbor defenses in 1880, patterned on contemporary European practices. The task of coastal defense was assigned to the Army. The next areas to see attention, starting in 1887, were Shimonoseki, which controlled access to the Inland Sea, and Tsushima Island, which covered the southern access to the Sea of Japan. Several other harbors were fortified by the end of the century. The Coastal Artillery became one of the most prestigious branches of the Imperial Japanese Army, and some of its heavy-howitzer units were configured for land combat in siege warfare, as was displayed at Port Arthur in 1904–05.

After the initial building spree of the 1880s and 1890s, the next major phase was prompted by the 1923 earthquake, which devastated the "Sea Forts"



BOTTOM LEFT
The early Japanese coastal artillery positions concentrated on major harbors and key straits, as in this case with a battery of the Class B fortress near Ominato covering the Tsugaru Straits between Honshu and Hokkaido. This 12cm 11th-Year Type gun is positioned in a typical concrete casemate with log restraining walls on either side of the embrasure. (NARA)



BOTTOM RIGHT
The 1922 naval treaty freed up a variety of warship gun turrets, which were used to modernize the IJA coastal artillery batteries. This is a 20cm turret that was deployed with 7th Company, 2nd Battalion of the Tokyo Bay Heavy Fortress Regiment near Tateyama on the Boso Peninsula covering the southeastern side of the access to Tokyo Bay. The two barrels fold into log trenches for camouflage. (NARA)

Fortresses in the Japanese Home Islands		
Fortress	**Location**	**Class**
Tokyo Bay	Tokyo Bay	A
Shimonoseki	western access to Inland Sea	A
Tsugaru	between Hokkaido and Honshu	B
Yura	Osaka Bay	B
Maizura	western Honshu	B
Hoyo Straits	between Kyushu and Shikoku	B
Tsushima	island covering access to Sea of Japan	B
Iki	island covering access to Sea of Japan	B
Nagasaki	Nagasaki harbor	B
Kita-Chishima	northern Kuriles	C
Soya	Hokkaido	C



TOP RIGHT
Besides Tokyo Bay, the only other Class A fortress in Japan was Tsushima Island, which covered the southern entrance to the Sea of Japan. This is one of two 30/45cm turrets installed near Tatsuno Saki near the southern end of Tsushima. (NARA)

in Tokyo harbor. This was followed by a program in the late 1920s to guard the Hoyo Straits, which were the southern access route to the Inland Sea. After its completion, the Tsugaru Straits between Honshu and Hokkaido were covered by modern gun batteries. Some powerful guns became available as a result of the 1922 Naval Disarmament Conference, and the Navy released 13 twin-gun cruiser and battleship turrets to the Army for coastal defense. In the late 1930s, a modernization effort was undertaken at several of the most important fortresses facing the Korean Straits and the Sea of Japan, including Shimonoseki, Iki, Tsushima, and Pusan.

In spite of the extension and modernization of the coastal fortifications in the 1930s, the importance of coastal artillery in Japanese defense policy declined precipitously from its glory days of the late 19th century. Growing Japanese confidence in their military prowess against regional rivals such as China and the Soviet Union led the shift to a more offensive orientation in Japanese strategy. By 1939, the IJA Coastal Artillery branch was minuscule, with only 267 officers and 3,074 enlisted men.

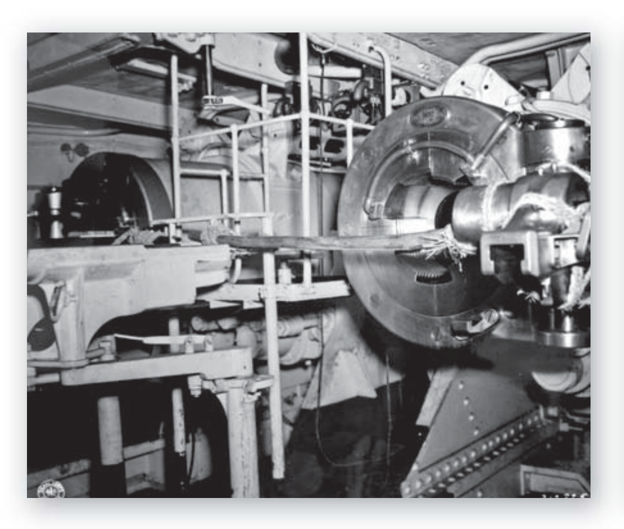
The premier form of coastal defense was the fortress; this term did not refer specifically to fortifications, but rather encompassed the entire defensive infrastructure of the area, including associated infantry units. The fortresses were categorized in three ranks – A, B and C – roughly corresponding to a corps, division, and brigade command.

Fortresses outside Japanese Home Islands	
Fortress	**Location**
Pusan	Korea
Rashin	Korea
Eiko	Korea
Amami-o-Shima	Ryukyus
Boko-To	island between Taiwan and China
Port Arthur	Manchuria
Kirun	Taiwan
Takao	Taiwan
Bonin Islands	Bonin Islands

A 3.7CM GUN COASTAL DEFENSE CASEMATE, 40TH ARMY, SOUTHERN KYUSHU

Beach defenses began to be constructed along the Kyushu shore under the Sho-Go plan in the autumn of 1944, often using older or obsolete weapons such as this 3.7cm Model 94 antitank gun. This is a standard design "Type 2 Casemate for One Rapid-Fire Gun" that was designed to be suitable for a wide range of infantry guns including the 3.7cm and 4.7cm antitank guns, the Type 41 7.5cm mountain gun, the Type 92 7cm infantry gun, and others. Behind the main fighting compartment was an ammunition room for 600 rounds, and the tunnel at the rear of the casemate was designed to accommodate stacked, folding bunks for the crew. The front and side walls were 3ft (91cm) thick and made of steel-reinforced concrete, and the bunker construction required about 15m^3 of concrete. Owing to material shortages, many casemates were built with only the front fighting compartment, with the aft chambers constructed from wood or simply tunneled into the hill.







TOP LEFT
An interior view of one of the turrets on Tateyama Bay showing the breeches of the 20cm/45 41st-Year Type (1908). (NARA)

TOP RIGHT
The IJA coastal artillery kept obsolete artillery in service through 1945. This is an old 28cm howitzer Model 1890 in a typical fixed emplacement near Odawara. (NARA)

BELOW
Japanese coastal artillery tended to rely on camouflage rather than concrete for protection as seen with this camouflage umbrella with its camouflage net removed for inspection. This battery was armed with the widely used 28cm 1890 howitzer. (NARA)

Military campaigns on the Asian mainland also brought coastal areas under Japanese control, so coastal fortification efforts began in Korea and China. These were oriented towards the control of waters offering access to Japan, and so were heavily concentrated in the areas around the Sea of Japan. Only the Pusan fortress was a class-A fortress; the rest were lower grades.

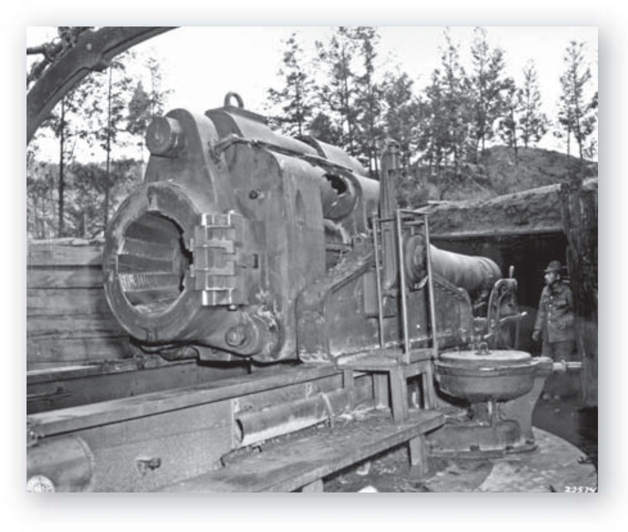
Prior to the start of the Pacific War in December 1941, the coastal artillery totaled 13 regiments including six in Japan, two in Taiwan, two in Korea, and four in Manchuria. The large number of these regiments in Manchuria reflected the coastal artillery's traditional role as siege artillery for the field army. Until 1941, most coastal artillery regiments were hybrid formations consisting of one seacoast artillery battalion and two heavy artillery battalions. In 1941, this organization was rationalized and the regiments were classified either as coastal artillery or heavy artillery. Control of the heavy artillery regiments was assigned to the field army. By 1945, the coastal artillery branch had expanded to 11 fortress heavy artillery regiments and one independent battalion as well as 11 independent heavy artillery regiments and 13 independent battalions.

There was little coastal gun development in Japan after World War I. The most impressive effort was a 41cm howitzer completed in 1926. When the Navy turned over some heavy ship guns to the coastal artillery in 1922–27 this project was abandoned, but the prototype gun was deployed in the Kotou fortress in Manchuria and saw some combat use in 1945 against the Red Army. The IJA acquired a German Rheinmetall 15cm SK C/28 naval gun for potential use as a coastal defense weapon, but it never entered production. The IJA never showed much interest in the use of railroad artillery for coastal defense. A single Schneider 24cm railroad gun was acquired in 1930 from France for trials, and was sent to Manchuria in 1941.



The IJA seldom retired obsolete weapons, and so 19th-century guns and mortars were still in service in 1945. The most common guns in use in 1945 included the 10cm Type 7 pedestal gun from 1918, the 15cm Type 45 pedestal gun from 1912, and the 15cm Type 96 field gun

from 1936. Several types of old heavy howitzers were still in use, though they would be classified as mortars by European or American standards. These included the 28cm 1890 howitzer (220 manufactured), 24cm Type 45 howitzer from 1912 (80 manufactured), and the 30.5cm Type 7 from 1918 (ten short barrel and 20 long barrel manufactured). Most of the coastal artillery weapons were in open gun pits, though with the lower portions protected either by earthworks or concrete. The IJA preferred camouflage over fortification, and many pedestal guns had a camouflage umbrella made from wooden frames and camouflage nets. Some had more elaborate disguises, including false structures to resemble a small building.



Another example of the retention of archaic-but-powerful weapons by the Army coastal defense units, in this case a 30cm Type 7 (1918) howitzer in a fixed mounting near Togane. These weapons were typically located in deep gun pits with camouflage umbrellas overhead. (NARA)

With the possibility of invasion of the Home Islands increasing after 1944, the number of coastal guns increased. The process of dispersing the old heavy coastal weapons away from the fortresses continued. Other sources of coastal artillery included obsolete weapons held in arsenals, and divisional artillery that was employed in a coastal-defense role. As mentioned below, the Navy also became involved in coastal-artillery deployment.

Japanese Army seacoast artillery 1945

	Kyushu	Shikoku	Honshu	Hokkaido	Total
7.5cm	11		36		47
9cm	3	4			7
10cm howitzer			8		8
10cm gun	7		44	6	57
12cm howitzer	2	4	2	6	14
12cm gun	12	6	14		32
14cm			2		2
15cm howitzer			4		4
15cm gun	30	4	64	24	122
20cm gun	1				1
20cm turret			4		4
21cm howitzer			4		4
24cm gun		10			10
24cm howitzer	4	4	10	1	19
25cm turret			4		4
27cm		8	4		12
28cm howitzer	13	6	62	10	91
30cm howitzer			4		4
30cm turret	4		8		12
40cm turret	2		2		4
Density per km of coast	*.022*	*.021*	*.027*	*.017*	*.022*
Total	**89**	**46**	**276**	**47**	**458**

IJN coastal defenses usually relied on dual-purpose, pedestal-mounted guns like this 12cm 10th-year Type (1921), part of the defenses near Kagoshima in southern Kyushu with the Mount Sakurajima volcano prominent in the background. (NARA)



IJN coastal defense

The IJN had traditionally been responsible for maritime defense of the coast. The Navy Ministry organized the Home Islands into four administrative naval districts (Yokosuka, Kure, Maizuru, and Sasebo) with six operational sectors (Yokuosuka, Kure, Maizuru, Sasebo, Osaka, and Ominato). By late 1944, each sector had an associated Seacoast Defense Command, which included an Air Flotilla, a Mobile Defense Force, a Sea Defense Command, and a Land Defense Command. The Sea Defense Command was typically broken down into regional Sea Defense Groups; so for example, the Yokosuka Sea Defense Command included the Chichijima, Ise, Yokosuka, and Onajawa Sea Defense Groups. Each of these contained an anti-submarine warfare (ASW) flotilla, a casemate unit, an observation detachment, and a maintenance battalion. The ASW flotilla controlled all the associated patrol vessels, submarine chasers, minelayers, and minesweepers assigned to that area. The casemate units were shore-based units that operated the controlled underwater mines in that area. The observation detachment primarily consisted of lookout posts to monitor enemy aircraft and ships. There were unfulfilled hopes of outfitting these units with radars.

A 12cm 10th-year Type (1921) gun of the Navy battery on Saishu Island off the southern tip of Korea in the Tsushima Straits. This provides a good illustration of a typical gun pit with ammunition niches around the edge. (NARA)

Although the Army remained responsible for coastal artillery throughout the war, the IJN deployed coastal guns with its Sea Defense Groups, especially after the 1943 Army–Navy agreement over the protection of the naval districts. These guns often were taken from damaged ships or were new guns from uncompleted warships. The most common were in the 5–6in. range (12–15cm). The main concentrations of IJN coastal artillery were found in the seacoast defense groups located at Tokyo Bay, Sagami Bay, Mutsu, Nagoya, Yura, the Hoyo Straits, Kagoshima, Tachibana Bay, and Sasebo. The density of the deployments depended on the importance of the site, so the Tokyo Bay area had 18 batteries while Nagoya had only three batteries.



Even though the IJN had only a marginal role in coastal artillery in the Japanese Home Islands, it was more active overseas. The IJN



The IJN erected coastal defenses near their major bases. This twin 15cm naval gun turret was located at Yokosuka, though it was intended primarily for training naval gun crews with only a secondary defensive role. (NARA)

Japanese Navy seacoast artillery 1945

	Kyushu	Shikoku	Honshu	Hokkaido	Total
8cm howitzer	8	1	12		21
8cm gun	6		15		21
12cm howitzer	8				8
12cm gun	23		14	6	43
14cm gun	16	4	34	3	57
15cm gun	16	12	22	8	58
Total	**77**	**17**	**97**	**17**	**208**

was responsible for the defense of numerous islands in Japan's forward defensive belt in the Central Pacific. Shore defenses usually included coastal artillery in protected gun pits. The forward deployed batteries are outside the scope of this book, but have been covered previously in Osprey Fortress 1: *Japanese Pacific Island Defenses 1941–45* (Osprey: Oxford, 2003).

Japan never engaged in a massive coastal defense fortification effort comparable to the German Atlantikwall. As can be seen from the figures above, Japanese coastal artillery was not particularly numerous in view of the extensive



A Navy Mark 2 Model 2 surface search radar in a coastal defense mount near Kushimoto on the southern tip of Kii Peninsula, covering the eastern side of the access into the Inland Sea. (NARA)

coastline. By way of comparison, German coastal artillery concentrations in France in 1944 were more than 30 times greater than in Japan, averaging nearly one gun per kilometer (0.6 miles). The Japanese Army was well aware of the details of the German program after Japanese liaison officers in Berlin had been given extensive tours of the fortifications in 1943–44. By the time that Japanese Home Island defense programs were accelerated in the summer and autumn of 1944, the Atlantikwall had been quickly breached by the Allies in Normandy. The uninspiring performance of the Atlantikwall as well as the limited value of coastal artillery in the Pacific island battles of Tarawa, Saipan, Guam, and Peleliu did not encourage the Japanese to invest heavily in fortified coastal artillery for Home Island defense in 1945.

Strategic air defense of the Home Islands through 1944

The Imperial Japanese Army was slow in deploying strategic antiaircraft-artillery defense, not forming the first antiaircraft regiment until 1924, and deploying only four regiments as late as 1939. This complacency stemmed from the lack of serious threats from neighboring China and the Soviet Union, as well as the belief that fighter aircraft were the better alternative. The outbreak of the Pacific War in December 1941 led to a general expansion of the IJA, with the antiaircraft artillery (AAA) branch of the field artillery increasing almost sixfold from about 12,500 men in 1939 to 68,500 in 1941.

Air defense units were regionally organized under the General Defense Command and the military districts. In 1941–42, each of the four main military districts had their formations under a tactical field army command and each of these armies typically deployed an air (interceptor) regiment, AAA regiment, and air-raid-warning unit. Since resources were limited, priority was given to the major metropolitan areas. At the start of the Pacific War in December 1941 the air-defense force was not particularly large, consisting of about 300 antiaircraft guns and about 100 obsolete Type 97 fighters. Air-raid warning was basic but extensive, consisting of a network of military and civilian observers, and an early warning patrol of IJN picket vessels stationed about 600 miles (965km) from shore. The IJA had begun deploying a chain of Type A radars in 1941, but these were primarily oriented toward the Sea of Japan, not the Pacific, since the Soviet Air Force was perceived as the only plausible air threat.

The Doolittle bombing raid on April 18, 1942 revealed the substantial flaws in Japanese air defense. Although the US naval battle group was detected by



LEFT
The most common Japanese heavy antiaircraft gun was the 7.5cm Type 88, used both by the Army and the Navy. This is the standard pedestal-mounted type for static defense, seen here at Kaminoshima, part of the Nagasaki defenses. (NARA)



RIGHT
The 8.8cm Type 99 antiaircraft gun was frequently deployed in the shielded configuration as seen here at Koiwa, part of the 1st Antiaircraft Division defense of Tokyo. (NARA)



The 12cm Type 3 was the best of the Army's antiaircraft weapons but it was built in too few numbers to have much impact. This particular gun belonged to the 1st Antiaircraft Division in Koiwa near Tokyo. (NARA)

IJN picket ships about 600 miles (965km) east of Japan, the assumption was that the carriers could launch only short-range carrier aircraft with a range of 300 miles (483km). So the attack was not expected to occur until April 19 at the earliest. The incoming B-25 bombers were first detected by an observation post 70 miles (113km) northeast of Tokyo. The warning was too late to permit adequate defensive measures and the air-raid warnings were not issued in Tokyo until the air raid had actually begun. The machine-gun armed Type 97 fighters proved to be ineffective against the B-25 bomber, and the antiaircraft batteries were not alerted in time. In response to the Doolittle Raid, the head of the General Defense Command, General (Prince) Naruhiko Higashikuni, insisted on reform of air defense. The main outcome was to expand and modernize the fighter force, which grew from three regiments to three brigades. New 88mm and 120mm antiaircraft guns and better radar entered production. The reform almost doubled the size of the force from 91,540 troops in 1942 to 171,000 in 1944.

Air defenses of the Home Islands in December 1941

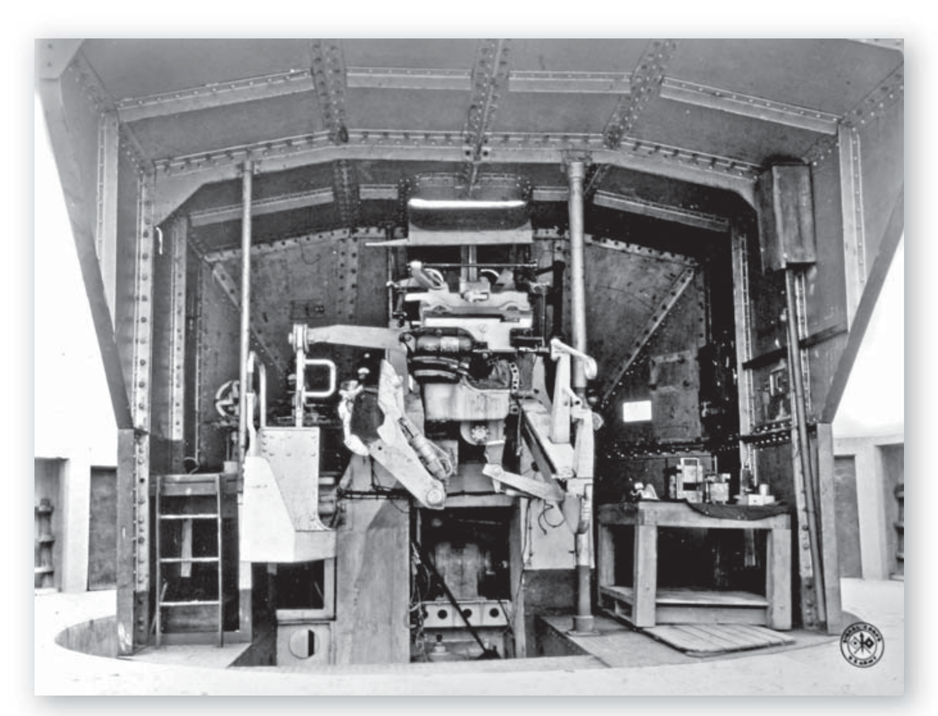
Defense area	Aircraft	AAA
Tokyo–Yokohoma	50	150
Nagoya	10	20
Osaka–Kobe	20	70
Kokura–Yawata	20	70

The military district antiaircraft brigades were renamed as AAA commands in the summer of 1944, and finally expanded to AAA divisions at the end of 1944. The AAA divisions were not concentrated at a single location, but rather had a dual administrative and tactical role. The 1st AAA Division, based in Tokyo, was by far the largest of the four divisions and included eight antiaircraft regiments and a searchlight regiment. Each antiaircraft regiment typically included two antiaircraft gun batteries and two searchlight batteries, and in total the division had 93 antiaircraft gun batteries. In the summer of 1944, there were plans to consolidate the Army's AAA units and fighter units

Antiaircraft-artillery organization in Japan 1945

General Army	Area Army	HQ	AAA Divisions	AA Guns
1st General Army	11th Area Army	Sendai	Independent regiments	65
	12th Area Army	Tokyo	1st Antiaircraft Division	780
	13th Area Army	Nagoya	2nd AA Division	195
2nd General Army	15th Area Army	Osaka	3rd AA Division	260
	16th Area Army	Kyushu	4th AA Division	390
	5th Area Army	Hokkaido	Independent regiments	65





LEFT
An interior view of the turret of a 12cm Type 3 of the 1st Antiaircraft Division near Tokyo. The large-caliber Japanese antiaircraft guns were generally built with partial turrets, open at the rear. (NARA)

BELOW
A number of captured antiaircraft guns were used in the defense of the Home Islands, including this British 3.7in. gun, one of ten captured in 1941–42 in Singapore along with 38 fixed versions. (NARA)

under a combined air defense command but the plan was dropped owing to bureaucratic resistance. By 1945, the IJA's antiaircraft-gun force included 569 gun batteries equipped with a total of 1,794 heavy antiaircraft guns and 860 small-caliber automatic cannon.

The principal antiaircraft gun for strategic defense was the Type 88 7.5cm gun, which had been accepted for service in 1928 in both fixed and mobile versions. It had a maximum altitude of 9,730yds (8,900m) though its practical ceiling was only 4,920yds (4,500m). Besides being used for air defense in the Home Islands, this weapon was widely deployed in Army units overseas with only 869 of these guns in Army units in the Home Islands in 1945 and the remainder overseas. The first new design to emerge during the war was the Type 99 8.5cm gun. Although the caliber of the gun might suggest a



B 15CM 3RD-YEAR TYPE NAVY DUAL-PURPOSE GUN, CAPE KIRISAKI, SASEBO NAVAL DEFENSE SECTOR

The most powerful naval antiaircraft guns were the small number of 15.5cm/60 3rd-Year Types (1914) that had originally been fitted on the *Mogami* cruisers and then later on the battleships *Yamato* and *Musashi*. A number of surplus tubes were used to create a dual-purpose, single-barrel antiaircraft/coastal defense gun. A new turret was built, open at the rear, with ammunition-handling equipment on the rear porch. This particular example was deployed on Cape Kirisaki, 9 miles (15km) south of Sasebo as part of the Sasebo naval defense sector on Kyushu.

The configuration is typical of Japanese Navy coastal gun positions, consisting of a submerged gun pit based on a concrete pad. The walls were made from wood with several small compartments carved into the sides as ammunition lockers. The posts emanating from the turret were intended to hold bamboo rods, which formed a camouflage umbrella. Usually, the gun would be entirely covered with camouflage.



The most powerful Army antiaircraft gun was the massive 15cm Type 5, but only two were built before US B-29 squadrons switched their tactics to low-level attacks, making such a weapon redundant. Both were deployed with the 1st Antiaircraft Division near the Imperial Palace in Tokyo. (NARA)

German connection, the weapon was an entirely indigenous design. Development of the gun was completed in 1939 but production did not begin until June 1942 after the Doolittle Raid. The gun offered mediocre high-altitude performance with a ceiling of 10,660yds (9,750m), which enabled it barely to reach the B-29's operating altitude. The shortcomings of the 7.5cm Type 88 gun led to a requirement for a more powerful design, and this led to the development of the 7.5cm Type 4 gun, based on a 75mm Bofors Model 29 captured in China. Production began in October 1944 but only 65 were completed before the end of the war.

Concerns over the threat of a strategic bomber operating at very high altitudes led to work on a much more powerful weapon, the 12cm Type 3, with an effective ceiling of 15,855yds (14,500m). This gun was patterned on the Navy's 12.7cm Type 89 gun. The first two guns were completed in December 1942 but production did not begin until November 1943; only 154 were

Japanese heavy antiaircraft-gun production 1942–45

	1942	1943	1944	1945	Total
Army					
7.5cm Type 4	0	0	12	53	65
7.5cm Type 88	431	929	655	210	2,225
8.8cm Type 99	23	274	423	199	919
12cm Type 3	2	15	67	70	154
15cm Type 5	0	0	0	2	2
Army subtotal	*456*	*1,218*	*1,157*	*534*	*3,365*
Navy					
7.6cm 3rd Year	70	60	60	10	200
8cm Type 98	8	4	1	0	13
10cm Type 98	40	70	40	10	160
12cm 10th Year	35	500	1,600	185	2,320
12.7cm Type 89	150	300	300	50	800
Navy subtotal	*303*	*934*	*2,001*	*255*	*3,493*
Grand total	**759**	**2,152**	**3,158**	**789**	**6,858**

C 7.5CM ANTIAIRCRAFT-GUN PIT, 134TH AAA REGIMENT, 4TH AAA DIVISION, NAGASAKI

The most widely deployed antiaircraft gun in the Home Islands was the 7.5cm Type 88 gun as seen here. The typical battery deployment consisted of six gun pits in a semicircular arc with the battery fire control located centrally behind the gun line. Each pair of gun pits would usually share an underground bunker located between them, with access via tunnels emanating from the gun pits. Although the standard design for these gun pits called for the use of steel-reinforced concrete, many if not most were of cheaper construction with a concrete pad and dirt walls reinforced with wood. Ammunition was stored in three lockers carved into the side of the walls.

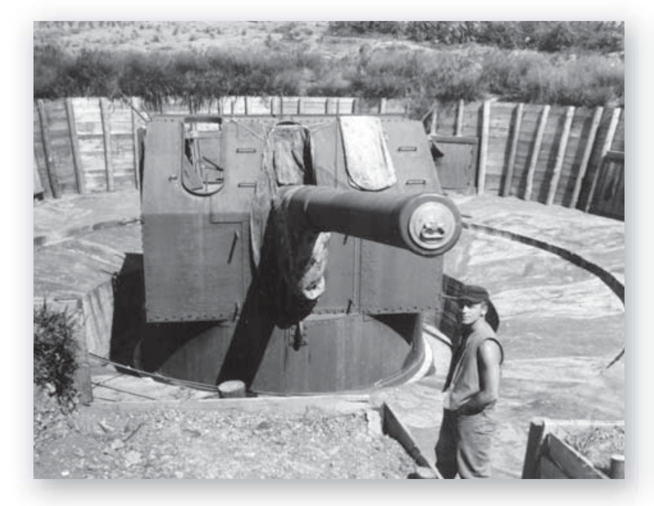




RIGHT
The Navy air defenses sometimes used turrets from damaged or uncompleted warships, like this standard naval mount for the 10cm Type 98 twin antiaircraft gun near Yokosuka. (NARA)

manufactured during the war. It was one of the few guns to be able to challenge the B-29 at high altitudes. Further intelligence reports about an American super-heavy bomber led to an effort to scale up the 12cm Type 3 gun to a 15cm gun. This had an effective ceiling of 20,800yds (19,000m) but only two had been completed by August 1945 and they were deployed in Tokyo near the Imperial Palace.

Besides the Army batteries, the IJN defended the major ports with some 981 large-caliber guns in service in 1945. The main focus of IJN antiaircraft deployment was not the Home Islands but overseas; fewer than 15 percent of Japanese naval AAA guns were deployed in Japan. Many of these guns were simply land-based versions of naval antiaircraft guns, but the Navy also used some Army weapons such as the 7.5cm Type 88, with 106 in Navy use in the Home Islands. The oldest was the 7.6cm 3rd-Year Type, accepted for service in 1914 and deployed on fixed pedestal mounts. This remained in production through 1945 and there were still 116 of these guns (12 percent) at the end of the war. The single most common naval antiaircraft gun was the old 12cm 10th-Year Type gun, accepted for service in 1921. This was deployed in a single mount from fixed concrete positions, and 377 were in ground service in the Home Islands at the end of the war; it was often deployed as a dual-purpose gun along the shore for both coastal and antiaircraft defense. Another widely used type was the 12.7cm Type 89, accepted for service in



BELOW LEFT
The most powerful naval antiaircraft guns were the few 15.5cm/60 3rd-Year Types (1914) that had originally been fitted on the *Mogami* cruisers and then later on the battleships *Yamato* and *Musashi*. A number of surplus tubes were used to create a single-barrel coastal air defense version; this example was deployed on Cape Kirisaki, 9 miles (15km) south of Sasebo. (NARA)



BELOW RIGHT
When the B-29 squadrons suddenly switched to low-level attacks, Japanese air defense regiments were poorly equipped to handle the change. Some small-caliber automatic cannon were available, such as this 20mm Type 2 in the Tokyo area with the 1st Antiaircraft Division. (NARA)

1929. It was a typical dual-purpose warship gun with an L/40 caliber, and so its high-altitude performance was inadequate. There were 314 in service in 1945, making it the second most common naval AAA gun.

Japanese Navy antiaircraft defenses in the Home Islands 1943–45			
	Mid-1943	Mid-1944	Early 1945
AAA guns	60	100	980
Heavy machine guns	90	950	3,700
Radars	9	20	55

Fire control and early warning

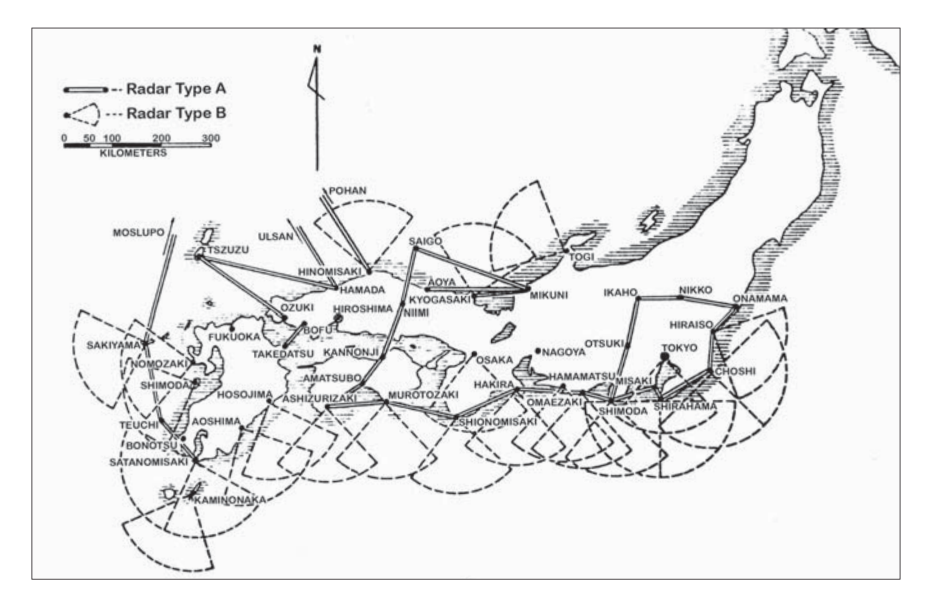
The primary problem facing Japanese antiaircraft units was not the mediocre quality and quantity of their guns, but the poor quality of their fire-control equipment. Japanese antiaircraft director manufacture during the war was actually a retrograde effort to replace the complicated and expensive Type 97 director with the simpler and cheaper Type 2. For night engagements each AAA regiment depended on two searchlight battalions, each with 18 Type 93 searchlights aimed by 18 archaic Type 95 sound locators.

The most important advance in air-defense technology in World War II was radar. Early warning radars were essential to provide enough time to scramble fighters to intercept incoming bombers and to provide location information to vector them to the right location and altitude. Fire-control radars were necessary to provide aiming data to antiaircraft guns to permit them to engage enemy bombers in all weather conditions and at night. Japanese radar development was not very advanced at the beginning of the war. A US Army report later noted that Japanese radar technology even in 1945 had only reached the level of US development in 1941.

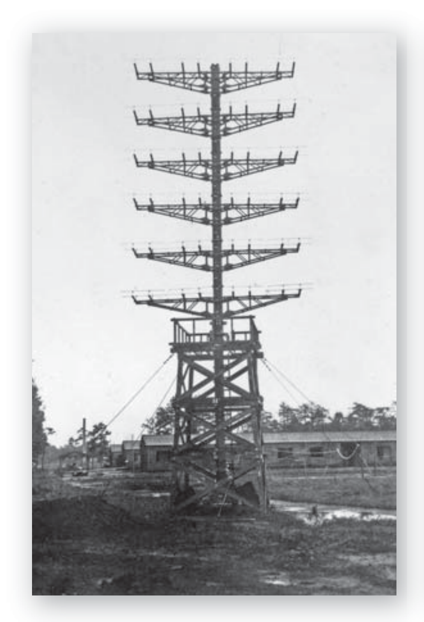


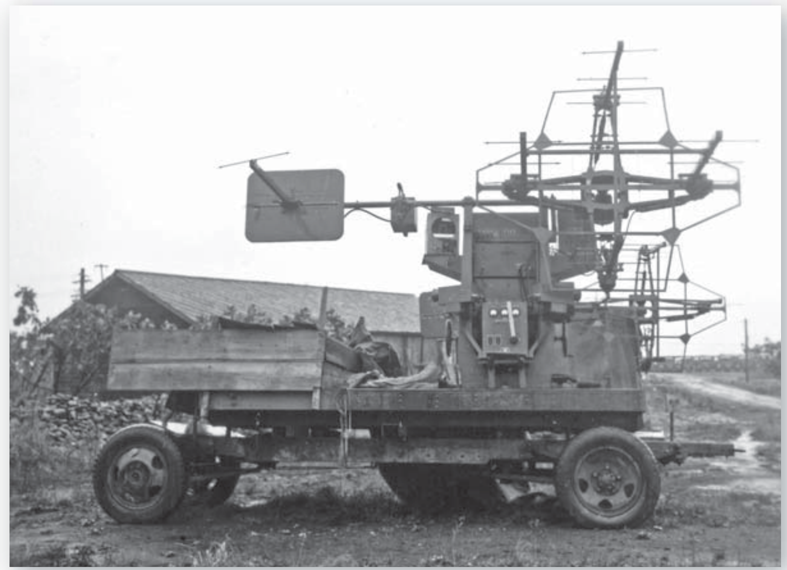
Direction for the searchlights was provided by sound locators such as this common Type 90 seen here at a Navy battery outside Nagasaki. (NARA)

The IJA's early warning radar efforts were initiated by the Army in the mid-1930s in cooperation with Nippon Electric Company (NEC) and led to



This map shows the disposition of Army early warning radars in 1945. (MHI)





TOP LEFT
The basis for the Japanese radar early warning network was the Type B. This is an example of the most common type, the portable Tachi 18 seen here at the Kodaira training center. (NARA)

TOP RIGHT
An Army NEC Tachi 1 searchlight-control radar at Muroran in 1945. This was one of the earliest fire-control radars but was not especially durable. (NARA)

the design of the bi-static Type A radar, popularly nicknamed the "bow-wow type" (*wan-wan-shiki*) from the sound made when targets were detected. This was a primitive design consisting of separate transmitting and receiving antennas located dozens of miles apart, which created an electronic fence to detect an enemy aircraft when it passed between them. Production was authorized in May 1940 and 120 sets were eventually produced, first becoming operational in 1941. This type of radar proved virtually useless in 1944–45 because it offered neither early warning of approaching aircraft nor any precise location data.



The Army's Taichi 2 was based on British searchlight-control radars captured in Singapore. This example was in use by the 1st Antiaircraft Division in Koiwa near Tokyo. (NARA)

Japanese military missions to Germany in 1941 learned of VHF (very high frequency) pulsed radars, which inspired a new generation of Army early warning radars, including the NEC Type B, later called the Tachi-6 in its fixed version, and the Tachi-7 in the mobile version. This was a considerable step forward in radar design since it could determine the azimuth and range of the target. Eventually, about 825 of these were manufactured for both the IJA and IJN and it became the most numerous Japanese early warning radar of the war and the basis of the Japanese air-defense network. Its main shortcoming was its short effective range of about 155–190 miles (250–300km). The Tachi name stemmed from the consolidation of various Army electronics labs into the Tama Technical Research Institute on July 15, 1943.

Japanese engineers enjoyed a technical windfall in early 1942 with the capture of British and American radars, notably British GL Mk.II gun-laying radars and the SLC searchlight-control radar in Singapore, and American SCR-268 fire-control and SCR-270 early warning radars in the Philippines.

There was considerable pressure to improve air defense in the wake of the Doolittle Raid in April 1942, and in June 1942 NEC and Toshiba were instructed to begin work on searchlight-control radars, influenced by the captured technology. This class of radar was not accurate enough for gunfire direction, but was adequate for steering searchlights at nighttime, significantly increasing their effectiveness. Trials began on both types in January 1943 but neither set was particularly effective and they were both so delicate that they were retained for use in Japan and not deployed overseas. The Toshiba Tachi-4 was a further evolution of the Tachi-2. Technology from the British GL Mk.II was incorporated into the Tachi-3, the first Japanese Army radar accurate enough for gun laying. Technology from the American SCR-270 radar was incorporated into the final version of the Type B early warning radar, the Tachi-18.

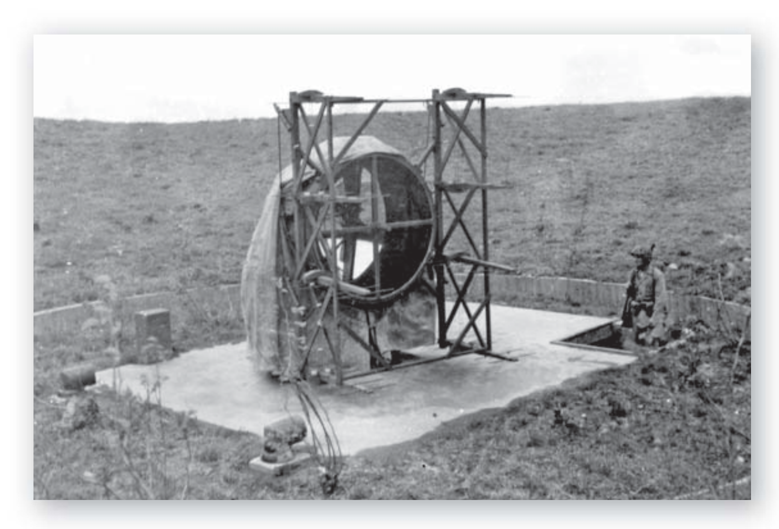
In one of the rare cases of German–Japanese cooperation, Germany provided the technology for one of its Würzburg fire-control radars. The first radar departed France on August 22, 1942 aboard submarine I-30, but it struck a British mine in Singapore harbor. Another attempt was made in the summer of 1943, with the radar being transported aboard two Italian submarines, but one of the two was sunk off Spain. A third attempt by a Japanese submarine

BOTTOM LEFT
The Taichi 3 radar was copied from the British Gun-Laying Radar Mk. II, and this is the transmitting antenna of a set deployed in Koiwa as part of the 1st Antiaircraft Division. (NARA)

BOTTOM RIGHT
The final fire-control radar manufactured in any quantity was the Type 4-kai, seen here with the 199th AA Regiment in Niigata prefecture on Honshu. (NARA)







The Navy developed its own searchlight-control radars, and the L-2 set included this receiver element that was integrated with the searchlight; the transmitter antenna was separate. This example was deployed near the village of Kamanoura between Nagasaki and Sasebo. (NARA)

was made at the end of 1943, with the technical drawings finally arriving safely. Production of a Würzburg copy, the Tachi-24, was barely under way when the war ended. However, some of the technology from the Würzburg was integrated into the indigenous Tachi-4 as the Tachi-4-kai or Tachi-31, which was the last and best mass-produced IJA fire-control radar of the war.

Total AAA fire-control radar production for the IJA in 1943–45 was only 349 sets. The most generously equipped sector was the 1st Antiaircraft Division, which covered Tokyo and central Honshu; it had 75 radars for its 23 gun battalions (127 batteries) with a density of three per battalion. In contrast, the 2nd Antiaircraft Division covering the area around Nagoya had only 6 radars for 9 gun battalions (48 batteries), with less than one per battalion. The poor quality and inadequate quantity of Japanese fire-control radars during the war years forced Japanese AAA units to continue to rely on primitive technology such as sound locators and searchlights.

As was the case in many areas of advanced technology, institutional rivalry between the IJA and IJN led to wasteful separate development efforts. The IJN's Naval Technical Research Department (NTRD) was primarily interested in the development of shipboard radars. A variety of early warning radars were developed, and in many cases both shipboard and land-based versions were manufactured. By far the most common was the Toshiba No.13 set, with over 1,000 manufactured, of which about a quarter were used for land-based applications. In general, surface-search radars were reserved for shipboard use but the No.22 and No.32 sets were developed so late in the war that they were

Japanese air-defense radars 1941–45

Type	Role	Production	Manufacturer	Quantity
Type A	EW	1941	NEC, Toshiba	120+
Tachi-6 (Type B fixed)	EW	1942–44	NEC, JRC, Matsushita	350
Tachi-7 (Type B mobile)	EW	1943–44	Iwasaki	60
Tachi-18 (Type B portable)	EW	1944–45	Toshiba, Iwasaki	400+
Tachi-1	SLC	Apr–Nov 1943	NEC	50
Tachi-2	SLC	Apr 1943 to Jan 1944	Toshiba	70
Tachi-4	SLC	Dec 1943 to Oct 1944	Toshiba	78
Tachi-3	GL	Nov 1943 to Aug 1944	NEC	67
Tachi-4-kai (Tachi-31)	GL	Sep 1944 to Aug 1945	Toshiba	84
Tachi-20	HF	1944	Anritsu	30

Tachi: contraction of Tama Institute and *chijo-yo* (ground-based)
EW: early warning
GL: gun laying
HF: height finder
SLC: searchlight control

Japanese naval air-defense radars				
Designation	**Short designation**	**Role**	**Development start**	**Number deployed on shore**
Type 2 Mark 1 Model 1	No.11	Fixed early warning	April 1941	75
Type 3 Mark 1 Model 1	No.11-k	Early warning	May 1943	25
Type 2 Mark 1 Model 2	No.12	Early warning	April 1942	25
Type 3 Mark 1 Model 3	No.13	Mobile early warning	April 1943	234
Type 3 Mark 1 Model 4	No.14	Long-range early warning	January 1945	3
Mark 2 Model 2	No.22	Surface search	September 1944	4
Mark 3 Model 2	No.32	Surface search	September 1944	4
Mark 4 Model 1	S3	Fire control	August 1942	50
Mark 4 Model 2	S24	Fire control	January 1943	60

too late for ship installation and so were used for coastal defense. The US SCR-268 fire-control radar formed the basis for the NEC S3 and S24 radars and these were used for land-based antiaircraft gun fire control.

One of the most curious offshoots of the Japanese radar program was the NTRD's attempt to develop the "Z-Weapon," a radio-frequency "death ray" to shoot down B-29 bombers. Although the device could kill rabbits at a 16.4ft (5m) range, it proved to be a futile quest.

Passive air defense

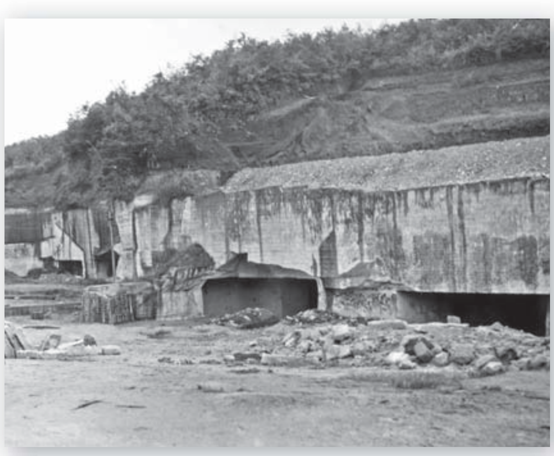
Prior to 1944, little attention had been paid to civilian and industrial air defense beyond the creation of bombproof shelters for national command authorities in Tokyo. Elaborate underground bombproof shelters were constructed for the headquarters of the IJA, the IJN, and IGHQ in 1941–42. Special shelters were constructed for the Emperor, such as the Obyunko within the Imperial Palace grounds starting on July 5, 1941.

The Doolittle Raid created some awareness of the need for civilian air-raid shelters, but the Ministry of Home Affairs placed the burden on local prefectures, which were obliged to use their own resources. Military control over concrete and steel supplies limited their options and the ministry provided instructions for open trench shelters in July 1942 and covered trench shelters in September 1943. In October 1943, the ministry ordered families in the major cities to create their own shelters, which were seldom much more than trenches.

BOTTOM LEFT
Japanese homeland defense occasionally incorporated reinforced concrete bunkers for air defense, such as this large air-warning center located in Sapporo. (NARA)

BOTTOM RIGHT
The B-29 raids forced Japanese industry underground. These are the entrances of a large underground plant being built under the hills for Nakajima's Otomeyama plant near Shiroyama for Ki-84 Hayate assembly; it was not completed before the war ended. (NARA)







Once the B-29 raids began, the favored approach to shelters became tunnels and caves large enough to accommodate large numbers of civilians. A postwar US assessment concluded that "the Japanese realized too late the importance of bomb-proofing and dispersal. The scarcity of materials and skilled labor accounted for much of the poor and unfinished construction. When they did design and plan and were able to carry through, the results were usually good." Less than 2 percent of the population had access to bombproof shelters, though the percentage was much higher in the cities.

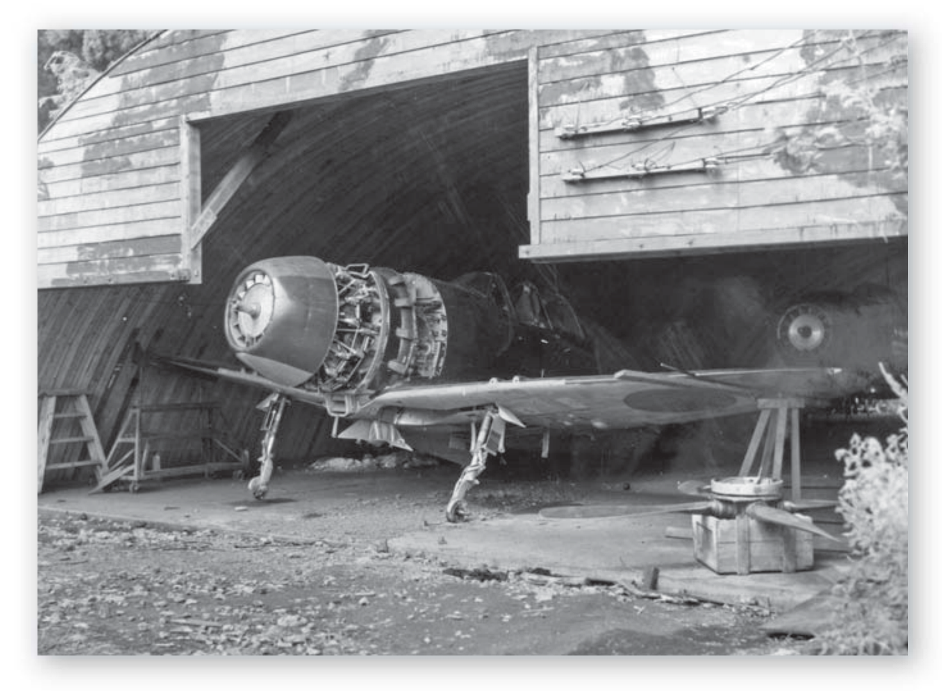
Some administrative centers were protected with bombproof shelters. City air-defense headquarters and control centers had concrete-reinforced structures. The Doolittle Raid demonstrated the vulnerability of the Japanese telephone network, so some key communication nodes were reinforced. The focus of the initial US B-29 raids in 1944 was the Japanese aviation industry. Although the Munitions Ministry was reluctant to approve plant dispersal even as late as December 1944 owing to the disruption it was likely to cause, by early 1945 the situation had become so grave that a major program was initiated to shield the aircraft industry from air attack. Since there were neither the resources nor the time to create elaborate underground or above-ground facilities, the traditional Japanese method of using tunnels and caves was chosen. About 70 percent of Japanese underground construction efforts in 1945 were directed toward the aircraft industry, with the rest going mostly to government and military headquarters. In February 1945, the government announced the "Urgent Dispersal of Plants Act" with priority afforded to the aircraft industry. Construction began on 100 underground aircraft plants, but only about half of the construction was completed by the war's end and few of the new plants reached operation.

In July 1944 the Cabinet agreed to a program to create an emergency construction corps under the Railroad Secretariat to build underground shelters for key government organizations. The most elaborate was a new Imperial General Headquarters built under mountains near the village of Matsuhiro in the Nagoya area starting in November 1944. The plan was to move the government and military commands to the new command center for the last-ditch defense of the Home Islands.

Another critical passive air-defense requirement was the need to protect Imperial Japanese Army Air Service (IJAAF) and IJN aircraft in Japan. A major element of the Ketsu-Go plan was the conservation of a large portion of the aircraft fleet to be used in a final wave of kamikaze attacks against the invading American forces. Until 1944, practically no efforts had been made to

D KOJIMACHI BRANCH EMERGENCY TELEPHONE BUNKER, TOKYO

The 1942 Doolittle Raid highlighted the vulnerability of the Japanese national communication system to even a small air raid. As a result, the Japanese government ordered the construction of a special bunker to protect essential national telephone communication in Tokyo, allotting a budget of some ¥5.4 million ($2 million). This bombproof design was singled out by postwar US inspections as the best example of strategic defensive architecture in either Japan or Germany. Construction was completed in November 1943. The design consisted of an inner core structure with an outer protective shell separated by a 32in. (81cm) air cushion; contact between either structure was minimized. The aim of the design was to prevent the concussion of a bomb strike on the outer shell from damaging the delicate electronic equipment inside the main structure. The outer shell was 9ft-thick (2.7m) steel-reinforced concrete, isolated from the inner structure at ground level with 362 concrete pilings extending 40ft (12m) into the ground for maximum shock absorption. The shell was designed to be upgraded with additional concrete of up to 33ft to resist bombs of up to ten tons. The inner structure wall was about 3ft (91cm) thick and the facility was protected by filtration against chemical weapon attack. In spite of the devastating firebomb raids on Tokyo, the Kojimachi bunker furnished the only communications link between the key cities of Tokyo, Yokosuka, and Osaka.



The B-29 air raids led to a program to disperse the aircraft industry, using tunnels and reinforced hangars for final assembly like this Mitsubishi line for the J2M3 Raiden (Jack) fighter at Atsugi Naval Airbase. (NARA)

construct hardened airbases. This changed in March 1944 due to the appearance of US Navy carrier aircraft off the Japanese coast, as well as air raids by the US Navy from bases in the Aleutians against the northern fringes of Japan. Some hardened individual aircraft shelters were built, but this was constrained by the cost and lack of resources. Instead, a program was begun to create 15 “Air Fortresses” in the Kuriles, Hokkaido, the Ryuku Islands, and Taiwan. These protected the aircraft in three ways: with increased antiaircraft guns, individual aircraft revetments, and remote dispersal areas. In practice, the air fortresses were not adequate when subjected to a determined low-level strafing attack or high-altitude bomber attack. In late 1944, this led to another look at underground shelters and individual hardened hangars, but again the principal impediment was resources rather than the technical merits. As a result, the IJAAF decided to emphasize concealment over hardening. Aircraft were moved miles away from the airbase and carefully camouflaged. A total of 41 concealed airfields were built in the Home Islands, with a special focus on Kyushu, which received nine of these. Although the concealed airfields proved to be useful for preserving the force, their use severely hampered day-to-day air-defense operations since it took hours to remove the camouflage and move the aircraft back to the airfields. As a result, in the summer of 1945 there was yet another wave of airfield construction using a conscripted civilian labor force, which combined the concepts of the “Air Fortress” with dispersal and revetments with the concealment features of the early 1945 program.



The most elaborate construction project in 1944 was a massive underground shelter for the Imperial General Headquarters and the Emperor located at Matsushiro in the mountains near Nagano, which was started in November 1944. This is the facility for the Imperial family built under Mount Minikami, with the regular living quarters and offices for the Emperor visible to the right and the underground tunnel complex to the left and not visible in this image. (NARA)

The IJN faced the same dilemmas as the IJAAF. Its 70 airbases and 24 seaplane bases were usually near the coast and efforts began in 1944 to increase the number of hardened shelters. However, the resources were simply not available and in early 1945 a program was begun to create 55 new "Pasture Grounds," the codename for new airbases, which placed the emphasis on dispersion and camouflage over fortification. In addition, efforts to create more storage caves were increased, especially for kamikaze aircraft.

A final change of course: the Ketsu-Go plan

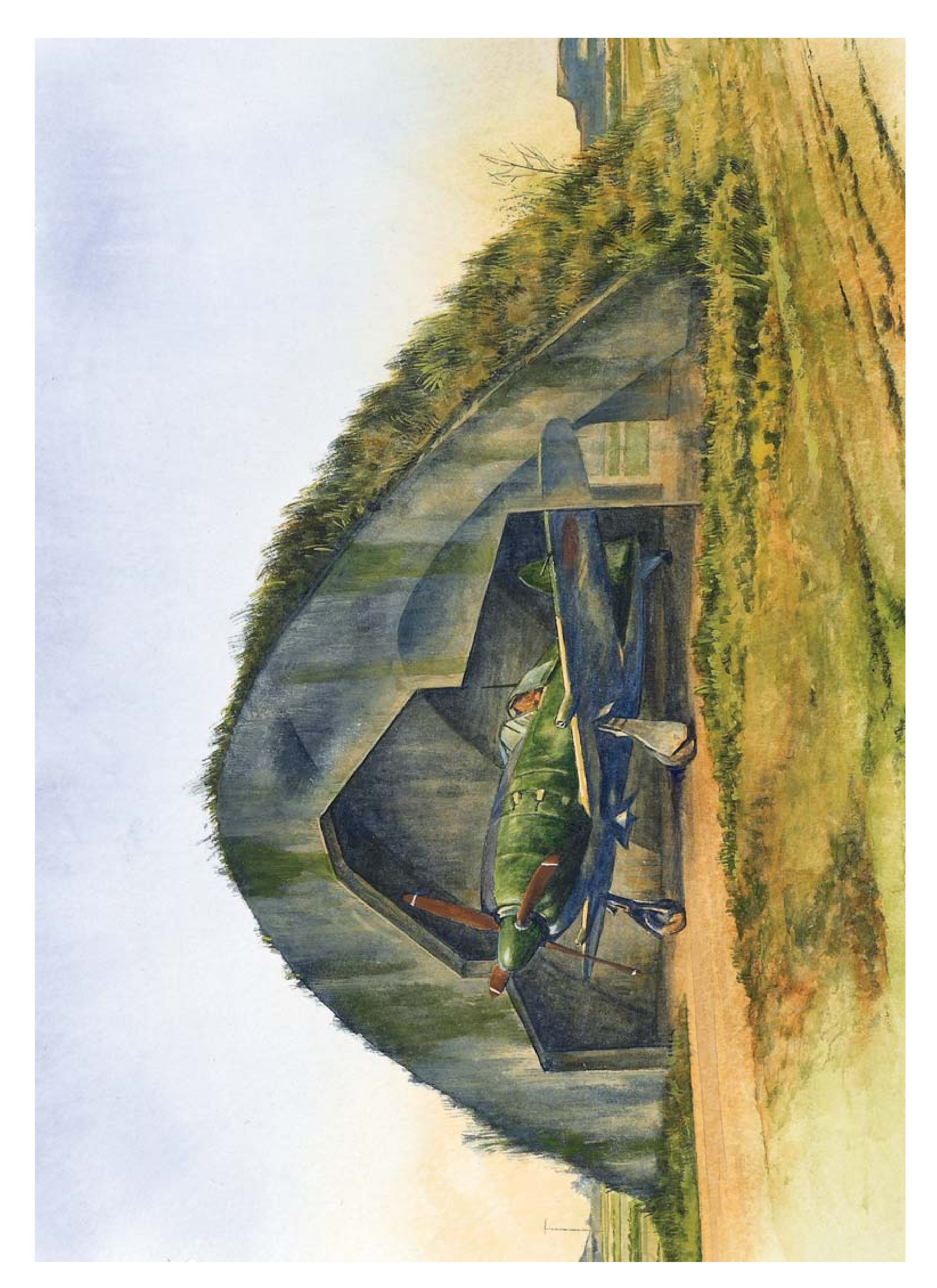
The course of the war in the Pacific took a dramatic turn for the worse in the latter half of 1944. In the central Pacific, the US invasion of the Marianas starting on June 15, 1944 penetrated Japan's inner defensive line. This gave the US Army Air Force (USAAF) access to airfields within B-29 range of Japan. The IJN responded with the A-Go plan, sending most of its carrier force toward the Philippine Sea where it was intercepted by the US Navy on June 19, 1944; most of the remaining IJN carrier aircraft force was annihilated in the "Marianas Turkey Shoot." The dire predicament created by the Marianas defeat forced the Imperial General Headquarters to release a revised strategic plan for the Pacific theater on July 21, 1944, codenamed "Sho-Go" (Victory Operation). Sho-Go contained four sections: No.1 covered defensive operations in the Philippines, No.2 covered the defense of Taiwan and the Ryukus, No.3 covered the main Home Islands of Kyushu, Shikoku and Honshu, and No.4 covered defensive plans in the northern Home Islands to deal with any potential Soviet threat.

As predicted by the Sho-Go No.1 plan, General Douglas MacArthur's forces extended their campaign into the Philippines, landing on Leyte in October 1944. The IJN hoped to turn defeat to victory with a bold naval strike against the US Navy amphibious forces off the Philippines, but during the battle of Leyte Gulf in late October 1944 much of the remainder of the Japanese surface fleet was sunk.

The decimation of Japanese carrier airpower in 1944 led to desperate measures. Realizing that its conventional aircraft were no longer a match for



The change in tactical doctrine for Ketsu-Go discouraged extensive beach fortification. A common type of bunker deployed on beaches during the final construction program was the artillery forward observer bunker, like this example on Muroran in southern Hokkaido. (NARA)



the US Navy, the IJN began to use suicide ramming attacks. Owing to the Emperor's ambivalent attitude towards this grim tactic, the euphemism "*tokko*" (from *tokubetsu kogeki*: special attack) was used by the military for all these suicide attacks, though they are more popularly known as "kamikaze" (divine wind). Conventional fighter, bomber, and torpedo-bomber aircraft were armed with bombs and sent on suicide attacks to crash into US Navy warships. The first mission, carried out by the IJN's 201st Air Group, was launched from Manila on October 21, 1944. Once the threshold had been crossed in the Leyte Gulf battle, the Navy began to expand its concept of *tokko* tactics to include manned torpedoes (Kaiten) and crash boats (Shinyo). The Army had already begun to plan the use of *tokko* tactics including suicide aircraft and an assortment of novel infantry weapons.

Besides its military defeats in 1944, Japan was faced with economic calamity owing to US submarine attacks and mine warfare against its merchant marine. Japan was heavily dependent on imported food and fuel, and by January 1945 about 70 percent of its merchant navy had been sunk. As a result, its military industries were becoming paralyzed. In January 1945, the US Army leapfrogged from Leyte to Luzon, making it clear that the IJA could not prevent the liberation of the Philippines.

On January 19, 1945 the Imperial General Headquarters submitted a new strategic plan to the Emperor known as Ketsu-Go. The plan finally admitted that "the final decisive battle of the war will be waged in Japan proper." Ketsu-Go was approved on January 20 and became the basic scheme for the final defense of the Japanese Home Islands. The plan attempted to redress the years of neglect of homeland defense by a crash program to raise new Army units in Japan itself. At the time, the Army had only nine divisions in the Home Islands, yet there was still reluctance to shift divisions from China, Manchuria, or Southeast Asia back to Japan for fear of losing control of the conquered territories. Ketsu-Go also recognized the shortages of equipment and the waning of conventional Japanese military power and so placed increasing emphasis on *tokko* tactics. There were no illusions about the ability of the IJA and IJN to prevent the US conducting amphibious landings on the Japanese coast, so the strategic objective of the plan was to inflict such severe losses on the American invaders that the US would be willing to conduct political negotiations to bring about an end to the war, short of unconditional surrender.

The campaigns in early 1945 served only to reinforce the need to accelerate the Ketsu-Go plan. On February 19, US forces landed on Japanese soil for the first time on Iwo Jima in the Bonin Islands, yet another step closer to the Home Islands. A frightening new phase of the B-29 attacks was unleashed on the night of March 9/10 when the bombing tactics switched from high-altitude daylight raids to low-altitude night raids. The ensuing firestorm killed about

E AIRFIELD REINFORCED CONCRETE HANGAR, 302ND NAVAL AIR GROUP, ATSUGI NAVAL AIRBASE

Japanese naval airbases incorporated steel-reinforced concrete shelters for their aircraft so long as material was available. These were built as steel-reinforced concrete arches to defend against small aircraft bombs and machine-gun fire. To minimize the use of material, they typically were built as a pair of stepped arches, with the smaller arch at the rear of the hanger large enough to accommodate the tail of the aircraft and the forward section large enough to accommodate the propeller. The version shown here was designed for single-engine fighters, but larger designs were also constructed for bombers. The high cost of these structures limited their construction and efforts in 1944–45 focused on dispersion and camouflage over fortification.

85,000 and destroyed half of Tokyo; over the next week the firebomb raids were extended to Osaka, Kobe, and Nagoya. The Navy had still not fully accepted the Ketsu-Go focus on homeland defense, and on March 20 they issued their own outline plan for immediate operations, singling out the Ryukyus as being the "focal point of the decisive battle for the defense of the Homeland." As if on cue, on March 25 the US began landing on Okinawa in the Ryukyus, bringing US forces to the doorstep of the Home Islands. The IJN no longer had enough naval power to contest the Okinawa landings, but launched "Ten-Go," a violent air campaign relying on *tokko* attacks against the US fleet off Okinawa.

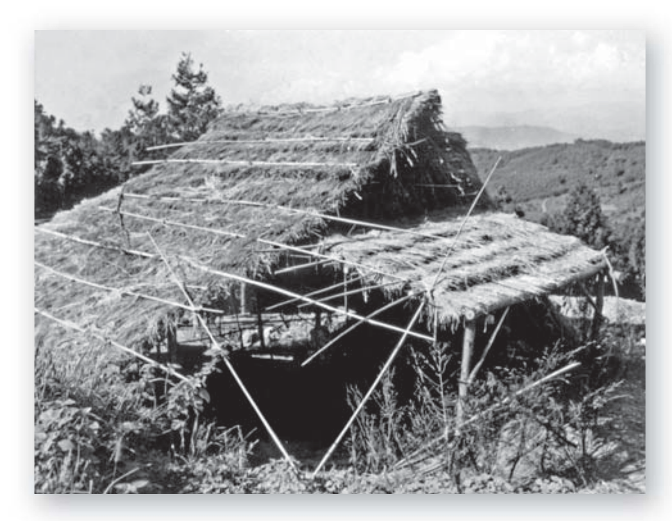
Reinforcing Home Island defenses

The first steps to reinforce Home Island defenses stemmed from the earlier Sho-Go No.3 plan from the summer of 1944. This effort was focused on the defense of the "national defense sphere," which included the Home Islands, but also the critical sectors nearby stretching from the Bonin Islands (Iwo Jima) to Taiwan and the east China coast opposite Japan and up to the Korean peninsula. The primary intention of the plan was to reinforce homeland air defenses, especially interceptor squadrons to protect against the growing threat of bomber attack. However, the plan also included the first major effort to reinforce coastal defenses by the creation of fortified infantry and artillery positions. This included the creation of defensive positions for 45 infantry battalions and 110 field guns in Japan, plus additional defenses in neighboring Korea. The plan met with substantial difficulties both due to shortages of concrete, as well as a lack of experience in the construction of coastal defenses. A survey of the defense sectors at the end of 1944 found that less than half of the positions had been created in the most vulnerable Western Military District and far less in other areas. The fortification of the Ryukyus, including Okinawa, had achieved only about 25 percent of its goals.

The principal change from Sho-Go No.3 to the Ketsu-Go plan of January 1945 was that it shifted the emphasis from air defense to anti-invasion defense. The Ketsu-Go plan was activated in early April 1945 owing to the calamitous degeneration of Japan's strategic position. Airbases on Okinawa placed Japan within reach of US fighter aircraft. On April 5, 1945 Moscow denounced the Russo-Japanese Neutrality Pact and Japanese intelligence had collected evidence that the Red Army had begun to transfer units from the European theater to the Pacific. The most likely threat was a Soviet attack into Manchuria, but an amphibious assault down Sakhalin to Hokkaido could not be ruled out. On April 6, the last major combatants of the IJN including the battleship Yamato sortied from the Inland Sea, but were decimated by American carrier aviation off Kyushu in the last major Japanese fleet action of the war.

Ketsu-Go outlined a three-phase mobilization plan, along with plans to recover several divisions, notably two armored divisions, from Manchuria back to Japan. The objective was to create a homeland defense

A lack of time and resources led the IJA to stress camouflage over fortification. This 28cm howitzer gun pit located outside Nagasaki shows the use of a camouflage umbrella disguised as the thatched roof of a rural house. (NARA)



force consisting of 26 line combat (infantry) divisions, 22 coastal combat divisions, two armored divisions, 21 independent mixed brigades, and six separate tank brigades. The coastal combat divisions were reduced-strength formations with lower manpower but higher firepower than regular infantry divisions. They had little or no organic transportation and so were basically intended as static divisions for positional defense; they were generally numbered in the 100 and 300 series. The new line divisions were conventional infantry formations and were intended to serve as the reserve force that could counterattack the American beachhead; they were numbered in the 200 series. Those numbered below 100 were the existing infantry divisions. Equipment stocks in Japan were insufficient to fully equip these formations, as there was the equivalent of only 40 divisional sets of equipment for the 65 divisional equivalents being raised.

Ketsu-Go envisioned the final battle in four phases. During Phase 1, prior to the sortie of the American invasion fleet, Japanese forces would attempt to disrupt the preparations by attacking American anchorages such as at Ulithi with submarines, submarine-launched aircraft, and long-range aircraft.

Ketsu-Go mobilization plan

	Initiation	Coastal divisions	Infantry divisions	Mixed brigades	Tank brigades
Phase 1	March 1945	13		1	
Phase 2	May 1945		8		6
Phase 3	May 23, 1945	9	17	14	

Imperial Japanese Army order of battle in the Home Islands, August 1945

Senior HQ	Army	HQ	Divisions	Independent Mixed Brigades	Independent Tank Brigades
1st General Army		**Tokyo**			
11th Area Army	50th Army	Aomori	72, 142, 157, 222, 308, 322	95, 113	
12th Area Army	36th Army	Urawa	1 Armd., 4 Armd., 81, 93, 201, 202, 209, 214		
	51st Army	Takahama	44, 151, 221	115, 116	7
	52nd Army	Shisui	3 G, 147, 152, 234		3
	53rd Army	Isehara	84, 140, 316	117	2
	Tokyo Bay Force	Tokyo Bay	354	96, 114	
	Tokyo Defense Army	Tokyo	1 G, 321, 1 AA	1 G, 2 G, 3 G, 66, 67	
13th Area Army	54th Army	Shinshiro	73, 143, 153, 224, 229, 355, 2 AA	97, 119, 120	8
2nd General Army		**Hiroshima**			
15th Area Army	55th Army	Shingai	11, 155, 205, 344	121	
	59th Army	Hiroshima	144, 225, 230, 231, 3 AA	123, 124	
16th Area Army		Futsukaichi	4 AA, 216	107,118, 122, 126	
	40th Army	Ijuin	77, 146, 206, 303	125	
	56th Army	Iizuka	57, 145, 312, 351		4
	57th Army	Takarabe	25, 86, 154, 156, 212	98, 109,	5, 6
5th Area Army		Sapporo	7, 42, 88, 91	101, 129	

Armd. = Armored
AA = Antiaircraft
G = Imperial Guards

Phase 2 would begin once the American amphibious force set sail for Japan. During this phase, Japanese forces would attempt to sink as many ships as possible, first using submarine and bomber attack. As the American fleet closed from 1,800 to 200 miles (2,900 to 320km) from the Japanese coast, the *tokko* attacks would begin with waves of Army and Navy suicide aircraft; Koryu short-range submarines would also be sent to attack either using conventional torpedo attacks or *tokko* attacks. As soon as Japanese intelligence determined the time of the American invasion, a series of long-range attacks would be conducted against US airbases on Iwo Jima, Okinawa and the Marianas to disrupt US air support of the landings and to facilitate further *tokko* attacks. Phase 3 would begin once the US invasion fleet began anchoring off the Japanese coast prior to landing. The first wave of attacks against gunfire support ships and transports would be the Koryu small submarines, followed by the Kaiten midget submarines. Once the amphibious landings began, the invasion force would be attacked at close range by Shinyo and Renraku-tei crash boats and long-range coastal artillery; all the while, *tokko* air attacks would continue. Phase 4 was the final ground campaign after US troops had landed. At this stage, the *tokko* attacks would continue, but artillery would shift from the anchorage areas to the beach. The coastal combat divisions would begin an immediate attack on the beachhead and the line combat divisions located in reserve farther inland would begin moving toward the beachheads to conduct counterattacks. Finally, if the US forces managed to move inland, they would be subjected to prolonged guerilla operations.

With Okinawa in American hands, Japanese planners examined the most probable conduct of US amphibious landings in Japan and concluded that the most likely locations for the initial landings would be Kyushu in the southwest. It was presumed that the US would want to conduct the operations within range of land-based airpower, and Kyushu was closest to US airbases. The consensus was that the US would invade Kyushu sometime around the autumn of 1945 and after establishing airbases there, would then conduct a final assault on the Kanto Plain to seize Tokyo sometime in early 1946. As a result of this assessment, the primary focus of Japanese reinforcements in mid-1945 was Kyushu, while the Kanto Plain and Tokyo area were presumed to be the ultimate objective and so were reinforced accordingly.

Even though the new tactics formulated under the Ketsu-Go plan de-emphasized beach defenses, an initial line of defense was created in many areas such as this typical trench line at Tosaki-bana. (NARA)



Ketsu-Go was obliged to address the tactical enigma of how best to defeat American amphibious tactics. In the 1943 period, Japanese defensive doctrine had favored the establishment of the main line of resistance (MLR) directly on the beach, epitomized by the defense of Tarawa and other small islands and atolls. This proved unsuccessful as the beach defenses were within view of American naval warships and were blasted by naval bombardment prior to the amphibious landing. The fighting in 1944 saw a shift away from a forward MLR on the beach to an MLR behind the beach, which was less vulnerable to naval gunfire. This tactic was used at

Saipan and Guam in the Marianas in the summer of 1944, but this change was undermined by the reflexive IJA use of violent mass counterattacks, which led to heavy casualties and a premature collapse in Japanese defenses. As a result, the tactical doctrine in early 1945 on Iwo Jima and Okinawa stressed the need to avoid costly banzai charges in favor of stealthy, dispersed attacks to maximize attrition of American forces. Although these tactics proved more successful than the earlier emphasis on heroic charges, Iwo Jima and Okinawa both exposed the growing American reliance on tanks and flamethrower tanks as the center of gravity in ground warfare. On Okinawa, the tactics shifted to a deep MLR with the IJA giving up the beach area and foreground in favor of an MLR located completely away from the range of naval guns. This doctrine proved no more satisfactory because the US forces seized valuable airfields against little resistance.



Some fortification was undertaken along the beaches, primarily forward observer positions to support artillery batteries located deep behind the beach. This is an example at Kagoshima on Kyushu. (NARA)

After Okinawa, there were two principal schools of thought about future defensive tactics. One group argued that fortification efforts in the Home Islands were too incomplete and the new divisions too poorly trained to conduct an adequate defense of the coastal region. Instead, they recommended a policy of fighting delaying actions, with units conserving their strength and attempting to maximize the attrition of American forces. The other school strongly objected to this approach, arguing that it would simply ensure that the Americans would quickly secure a base of operations in southern Kyushu at little cost, and then move on to the main blow against the Kanto Plains and Tokyo itself. In the end, a compromise was reached which did not satisfy either side in the argument. The new tactical doctrine suggested that the MLR should not be located on the beach, but that it should not be located too far behind the beach since once the Americans were ashore it was usually impossible to dislodge them.

Ketsu-Go included an extensive fortification effort, but nothing comparable to the German Atlantikwall approach that had greeted the Allies on D-Day in Normandy. The basic precepts were set down by the instructions entitled: "Three Basic Precepts on How to Fight the Americans." The basic rules were:

1. Positions should be constructed beyond the effective range of enemy naval bombardment.
2. Cave-type positions should be constructed against enemy air raids and naval bombardment.
3. Inaccessible high ground should be selected as protection against enemy flame-throwing tanks.

The defensive doctrine saw five layers of defense. Since the new doctrine opposed the establishment of the MLR on the beach, the number of pillboxes and other beach defenses were very modest and served as a forward

observation line. Although beach defenses were minimized, some beach defenses were included in the plans in order to cause maximum attrition on landing US forces. This included IJN *tokko* forces in the shallow water, and a variety of more conventional beach defenses and gun positions. The second layer was the foreground zone, which was located immediately behind the beach and consisted both of mines and obstacles as well as assault tunnels to permit continued attrition of the invading force after it exited the beach. The main line of resistance consisted of a line of battalion strongpoints optimized for antitank defense. This included bunkers as well as antitank-gun positions and shelters for infantry to conduct *tokko* antitank attack. The aim of this line was to hold the invading force long enough to permit the counterattack force to mass and attack. The rear defense zones were a secondary MLR in critical areas to provide a fallback position in the event that the main MLR was penetrated. The 1945 tactics specifically forbade the last-ditch "banzai charge" that so often decimated the Japanese garrisons in the central Pacific campaign. Finally, the fifth line consisted of inland fortifications that were primarily intended to shelter large items such as tanks and trucks as well as stocks of fuel and supplies.

Japan's precarious economic predicament in the spring and summer of 1944 also precluded extensive field fortification work. Civilian levies were a mixed blessing because food rations had fallen to only about 65 percent of acceptable levels, and civilian laborers were often unable to carry out arduous field-fortification work. Instead, Ketsu-Go tended to emphasize the exploitation of local terrain features where available, especially caves, and to use camouflage as an alternative to fortification. The "Three Principles" were in many cases followed too literally by units completely inexperienced in designing fortifications, and so were poorly laid out in terms of terrain or the mutual support of neighboring units. The violation of elementary fortification precepts led many staff officers to conclude that such defenses would not provide much value in defeating the American amphibious assault.

There was serious doubt that these fortifications and new tactics could prevent the establishment of an American beachhead, and both Iwo Jima and Okinawa suggested that such defenses could not inflict catastrophic losses on American ground forces. To amplify the attrition potential of the ground defenses, Ketsu-Go added a scheme called the National Resistance Program. Under this program, every Japanese citizen except for the young, infirm, and old were expected to sacrifice their life in suicide attacks on American troops and tanks. Civilians were equipped with any weapon available, including sharpened sticks and knives, and instructed to attack American forces at every opportunity. The National Volunteer Force had a nominal strength of 28 million, though in reality there was little training and fewer weapons. It is unlikely that such tactics would have substantially increased American casualties, but it would have made every civilian a military target exposed to overwhelming American firepower.

The more sober Japanese planners realized that mass mobilization and infantry *tokko* tactics were unlikely to have a decisive effect on the defense of Japan. The only miracle weapon that might turn the tide in favor of Japan was a more effective campaign of air and naval *tokko* tactics against the American amphibious force when it was concentrated aboard ships. A single kamikaze striking a transport ship had the potential to kill hundreds of enemy troops. As a result, Ketsu-Go expected that *tokko* operations would be absolutely vital to the final defense of Japan.

Tokko *defense*

While the Japanese armed forces attempted to depict *tokko* special attack weapons as a deeply traditional mode of Japanese warfare, the suicide attacks were initially greeted with revulsion and alarm when first proposed in 1943. It was only in the desperate conditions after the summer of 1944 that the tactics won wider acceptance, based on a ruthless assessment of military requirements and not a purported reversion to tradition. Initial schemes to develop *tokko* weapons were in part due to Japanese technological failures to manufacture advanced precision weapons, owing to shortcomings in the Japanese electronics industry. Attempts to develop guided anti-ship missiles comparable to the German Hs.293 or Fritz-X came too late. This led to a proposal in the summer of 1944 to develop a rocket-powered anti-ship missile using human guidance that eventually emerged as the MXY7 Ohka (Cherry Blossom). Failure to develop guided torpedoes prompted proposals to develop a manned torpedo as early as 1943, but were initially rejected since there were no provisions for the operator to escape; the disasters of 1944 removed these inhibitions and led to the development of the Kaiten suicide submarines in 1944. The catalyst for the *tokko* attacks was the battle of the Philippine Sea on June 19, 1944, which resulted in the wholesale destruction of much of the remaining Japanese carrier pilot cadre with little damage to the US fleet to show for the enormous sacrifices. Vice Admiral Takijiro Onishi commanding the 1st Air Fleet argued that as long as the pilots were going to die in any combat operation, then their deaths should not be futile.

Although a great deal of effort would be devoted to specialized *tokko* weapons, the most successful were conventional aircraft that were converted into suicide attack aircraft simply by attaching bombs and modified fuses to permit detonation on impact. Onishi created the first *tokko* force in the Philippines, and the initial attack took place on October 25, 1944 during the battle of Leyte Gulf. Only 12 aircraft managed to sink the escort carrier *St. Lo* and damage two more. These spectacular early successes removed the last inhibitions against suicide attacks, and the *tokko* missions increased in frequency and intensity through the spring of 1945, culminating in over a thousand sorties in April 1945 off Okinawa. In total, about 3,000 *tokko* missions were flown from October 1944 to August 1945.

The Japanese high command exaggerated the effectiveness of the kamikaze attacks based on overstated Navy and Army claims. The Japanese estimated that six aircraft carriers, one escort carrier and ten battleships had been sunk along with a variety of other ships for a grand total of 81 sinkings. Half the US carrier force was believed sunk during the furious Okinawa attacks. In fact, no carriers or battleships were sunk. A total of three small escort carriers had been sunk and the total number of sunken ships was 34 with the brunt falling on destroyers, which formed the picket screen around the fleet.



The first dedicated *tokko* aircraft was the Kugisho MXY7 Ohka (Cherry Blossom) rocket plane. After mixed results during its initial use in early 1945, most Ohka strength was conserved for the final battle of Japan, often in reinforced shelters like this one. (NARA)

Regardless of the precise damage inflicted, the *tokko* missions provided a rare opportunity for the Japanese armed forces to inflict serious damage on American forces at a point in the war when conventional tactics were proving to be both costly and ineffective. As a result, *tokko* tactics were central to the Ketsu-Go plan and were amplified considerably beyond the improvised air attacks of the Philippines, Iwo Jima, and Okinawa battles. A broad range of *tokko* weapons and tactics were integral to the plan in the air, on the sea, and on the land. A conference at Sixth Air Army headquarters in July 1945 concluded that *tokko* missions could have a decisive impact on repulsing the American naval invasion and could be expected to sink a third to a half of the invasion force. The sheer volume of *tokko* attacks would accomplish this.

By the summer of 1944, the IJN had about 4,300 trainer aircraft in Japan that could be converted to *tokko* aircraft. This included not only dedicated primary trainers and advanced trainers, but also obsolete fighters such as the Zero, which were being used in the trainer role. In addition, 700 dive bombers, torpedo bombers, and other attack aircraft including medium bombers would be allotted to the *tokko* force. The most modern fighters such as the Raiden (Jack) and Shiden (George) were initially withheld from the *tokko* force on the presumption that escorts would be needed; likewise, reconnaissance aircraft were also exempted. Eventually, all aircraft would be expended in *tokko* attacks.

The July conference estimated that about 60 percent of the available force would actually be operational at the time of the American landings and that of the 2,400 taking part, about one in six (or 400) aircraft would score hits. The IJA argued more optimistically that one in three would score hits since the targets would be in the crowded transport areas, not against a dispersed fleet with heavy antiaircraft protection as had been the case in the 1944–45 naval battles. These attacks would be amplified by naval *tokko* attacks using the Shinyo crash boats and manned torpedoes, which might score one in ten hits per mission for a total of about 70 more US ship losses. These projections concluded that the shipping accommodating five US divisions would be sunk in the initial phase of the operation, erasing a third of the invasion force. Since the objective was to sink 500 American transport ships, plans were made to

IJN aircraft in Ketsu-Go plan July 15, 1945

	3rd Air Fleet (Kyushu)	5th Air Fleet (Honshu)	10th Air Fleet (training command)	Total	Operational
Fighters	449	378	122	949	523
Night fighters	133	28	0	161	107
Bombers	0	88	166	254	171
Carrier bombers	157	119	99	375	277
Carrier attack	90	52	65	207	148
Land-based bombers	40	49	0	89	72
Land-based attack	25	60	112	197	123
Land-based recon	49	55	0	104	47
Seaplanes	152	71	0	223	189
Intermediate trainers	478	1,106	659	2,243	1,698
Utility trainers	167	238	19	424	320
Total	**1,740**	**2,244**	**1,242**	**5,226**	**3,675**



This illustration shows the Ohka Type 43, a turbojet-powered kamikaze aircraft with extended wings for ground launch from coastal sites using a rocket-carriage as a catapult. Construction of their bases with accompanying rail launchers and caves began in the summer of 1945, but production had barely started when the war ended. (Author)

increase the inventory of *tokko* aircraft by concentrating on dedicated types such as the IJN Ohka and the IJA Tsurugi, which would increase the inventory by over 2,000 aircraft by the end of the year.

The new *tokko* aircraft types were a mixture of advanced jet- and rocket-powered aircraft as well as low-cost conventional designs. The rocket-powered Ohka Type 11 first entered production in October 1944 and was first used in combat in March 1945 from Kyushu. These small aircraft were dropped from the G4M2 (Betty) bomber, which proved to be too slow and vulnerable to interception. Following its combat use in the spring of 1945, there were about 230 Ohka Type 11s still in inventory in July 1945, which were hoarded for Ketsu-Go.

The Type 11 was supposed to be replaced by the jet-powered Ohka Type 22, which could be carried on the faster P1Y (Frances) and launched from a greater distance to increase the chance of survival against American carrier air cover. It was entering production on a small scale when the war ended. The most intriguing version was the Ohka Type 43, a forerunner of modern coastal anti-ship missiles. This version used extended wings and a turbo-jet engine and was designed for ground launch from a rocket-propelled cart. Each special base would consist of several catapult launchers and associated caves to shelter the

Planned IJN *tokko* aircraft production in 1945

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Ohka Type 22	6	49	30	50	60	60	60		315
Ohka Type 43			2	10	22	38	65	80	217
Kikka				12	125	10	40		187
Shusui		35	90	145	225				495
Ki-115				10	150	320	400		880
Total	**6**	**84**	**122**	**227**	**582**	**428**	**565**	**80**	**2,094**

Ohka prior to launch. The first Ohka Type 43 base began construction in July 1945 on the Miura peninsula and there were plans to construct 41 launchers and 245 shelters by mid-October 1945 at seven sites. A catapult launch site was in operation at Takeyama near Yokosuka for training Ohka 43 pilots. Although several of the sites were completed and catapult tests conducted, series production did not start before the end of the war.

The Army air brigades had a smaller force in Japan for the Ketsu-Go plan than the Navy did. Conversion of obsolete aircraft types, especially the Ki-43 Type 1 (Oscar) fighters, began in late 1944. By the end of the war, the Army had only about 800 operational fighters and bombers and about 2,100 dedicated kamikaze aircraft in Japan and the neighboring air sectors. These were split between the 1st Air Army in the Tokyo area (600), 6th Air Army headquartered at Fukuoka (1,000), and the 5th Air Army headquartered at Seoul in Korea (500). The Army did not have as extensive a *tokko* manufacturing capability as the Navy and showed far less interest in novel technologies such as rocket and jet propulsion. The only one to reach production was the Nakajimi Ki-115 Tsurugi (Sword), an IJA attempt to match the Ohka using simpler propeller technology; a total of 105 were manufactured in April–August 1945.

Tokko *naval craft*

The first of the *tokko* naval craft came, curiously enough, from the Army's shipping engineers responsible for logistics in the Pacific. In April 1944, Lieutenant-General Yoshiaburo Suzuki proposed arming small boats with explosives and other weapons to conduct fast raids against invading American amphibious forces. Boat construction along with the formation of the first sea-raiding regiments began in September 1944. When the project began there was still some ambivalence about suicide tactics, so the boats had two tactics: either a fast pass near the enemy ship, at which point two depth charges would be released off the rear to detonate under the enemy ship, or direct ramming, which would detonate an explosive charge in the bow. They were crewed by young 16–17-year-old officer cadets who were posthumously advanced to the rank of lieutenant after their mission. The crash boats were euphemistically called Renraku-tai (Liaison Boats). The sea-raiding regiments used the cover name of Akatsuki (dawn) regiments. They consisted of three boat companies each with 18 crash boats. These units saw their debut during the Okinawa campaign where seven regiments and over 700 boats were deployed on Kerama



The Army's Renraku-tai crash boats had an angled ramp at the rear for a pair of depth charges that could be dropped near US landing craft; the clamps to hold the depth charges can be seen immediately behind the pilot. This example was captured in the Ryukyus near Aka Shima in March 1945. (NARA)

Retto and some of the neighboring islands. They were sometimes used in conjunction with combat swimmers armed with hand grenades. They were a dangerous nuisance but not especially effective since most were intercepted and sunk by PT-boat "flycatcher" patrols; they sank one LCI (Landing Craft, Infantry) and damaged two destroyers and one landing craft.



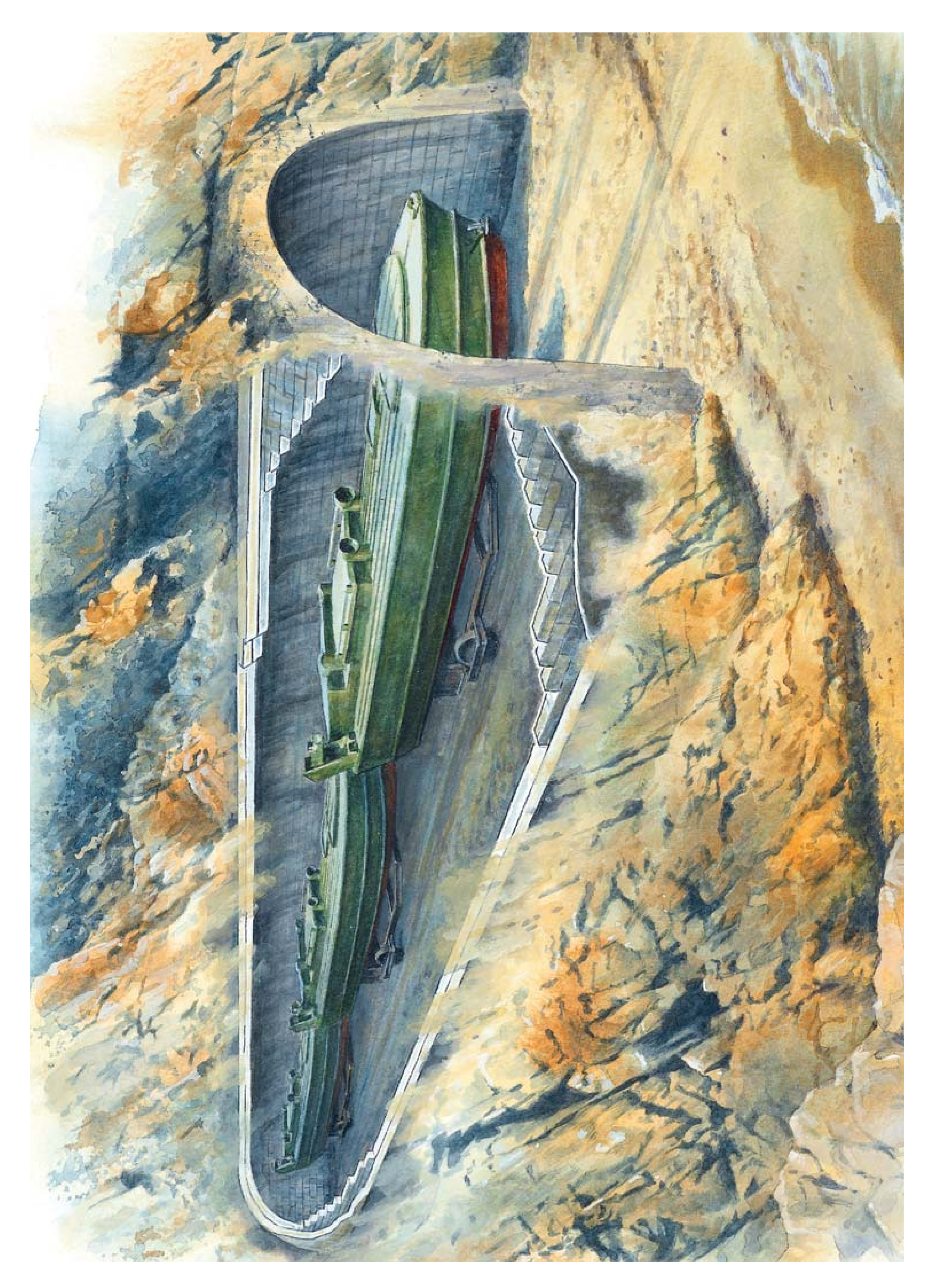
The Navy's Shinyo crash boats can be distinguished from the Army boats by the use of a simple wooden launch rail for a 12cm rocket on either rear corner. This Shinyo Type 1 Mod 4 was photographed in Ogushi harbor after the war, part of the Kawatana Attack Group near Sasebo on the northwest Kyushu coast. (NARA)

The IJN became aware of the IJA idea in the summer of 1944. Not to be outdone, it set up its own crash-boat detachments. The Shinyo (Ocean Quake) crash boats were very similar to the Army's Renraku-tai except that they lacked the depth-charge option and were designed for ramming attacks from the outset. To distinguish them from the Army boats, the Shinyo boats carried an auxiliary armament of two crude 12cm rocket launchers on the stern that could be used to distract enemy gunners during the race to the target, or alternately could be fired at the target prior to impact. A larger version, the Type 5, was also built, which had a two-man crew for use as a division leader and this contained a heavy machine gun to help defend the Shinyo formation against American patrol boats. The crews were recruited from middle-school boys, who were 15 or 16 years old. The first units were raised at Sasebo in late 1944 and deployed to Corregidor in the Philippines, where they saw little action. The IJN planned to build about 7,000 by September 1945 and a few thousand were completed before the end of the war, not only in Japan, but also in Singapore, China, and the Dutch East Indies.

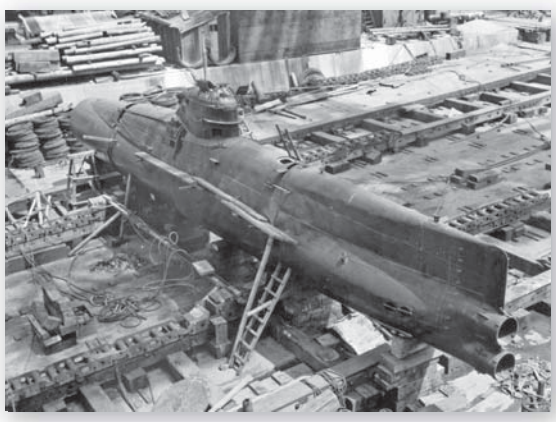
Besides the suicide crash boats, the IJN also built a variety of midget submarines and manned torpedoes for *tokko* missions. The best known of these was the Kaiten (*kaiten igyo*, or "great undertaking") manned torpedo. The program began in March 1944 and the Kaiten Type 1 was derived from the Type 93 Model 3 torpedo with an enlarged center section for the single crewman and an enlarged warhead section. These could be launched by a variety of means including from submarines, from special warships, and from the coast. The most common delivery method was by submarine and between two and six Kaiten could be carried on the deck of a submarine

IJN *tokko* naval weapon production in 1945

	April	May	June	April–June (subtotal)	April–June (planned)	July–September (planned)	October 1945–March 1946 (planned)
Small submarines	0	2	2	4	6	14	20
Koryu	12	12	20	44	110	430	1,000
Kairyu	9	42	74	125	300	550	1,000
Kaiten	66	42	51	159	250		
Shinyo Type 1	68	316	284	668	1,200	1,350	1,000
Shinyo Type 5	181	167	111	459	450	900	200







depending on its size. Production began in August 1944 and they were first used in the opening phases of the Ketsu-Go operation, carried onboard IJN fleet submarines to the Ulithi atoll to attack the US fleet anchorage. After many sorties, the submarine-launched Kaiten proved to be largely ineffective after sinking only two ships. They were also intended to be used in the final defense of Japan based on the coast. More than 400 were built before the end of the war, mostly the original Type 1.

Two types of midget coastal defense submarines were developed in 1944, the Koryu and Kairyu, which were both designed to carry two torpedoes. The Koryu carried them stacked one above the other in bow launch tubes, while the Kairyu had the torpedoes externally mounted on the lower hull casing. Although they could fire their torpedoes and escape, they were expected to use ramming tactics to ensure the destruction of the target ship. The Koryu was considered the most effective *tokko* submarine with an anticipated exchange ratio of two ships sunk for every three Koryus, compared with only 1:3 for Kaitens and Kairyus, and only 1:10 for the Shinyo crash boats. A total of about 110 Kairyus and 250 Koryus were built by the end of the war, but they did not see extensive combat use.

The IJN organized the coastal-defense *tokko* units into Assault Groups, which contained a mixed assortment of midget submarines, manned torpedoes, and crash boats. The Army crash boats in the Home Islands also came under the tactical control of these groups.

Aside from a variety of *tokko* craft, the IJN was also preparing close-combat *tokko* units for destroying American landing craft on their approach to the beach. The Fukuryu (Crouching Dragon) underwater attack units, also called the Water's Edge Surprise Attack Force, was a novel attempt by the Yokosuka naval district to develop methods to attack ships underwater using frogmen. A diving suit was developed, with about 1,000 manufactured by August 1945 and a total of 8,000 planned by September 1945. The Fukuryu force was

TOP LEFT
The scale of Shinyo construction is clearly indicated by this view of a harbor near Sasebo after the war, a small portion of the Kawatana Attack Group. (NARA)

TOP RIGHT
One of the more common *tokko* submarines was the Koryu (Type D), with plans to complete 570 by the end of September 1945. It had a crew of five and was armed with two 45cm torpedoes. This example was built at the Yokosuka navy yard, where it is seen shortly after the war. (NARA)

F SHINYO CRASH-BOAT BUNKER, 33RD ATTACK GROUP, KYUSHU

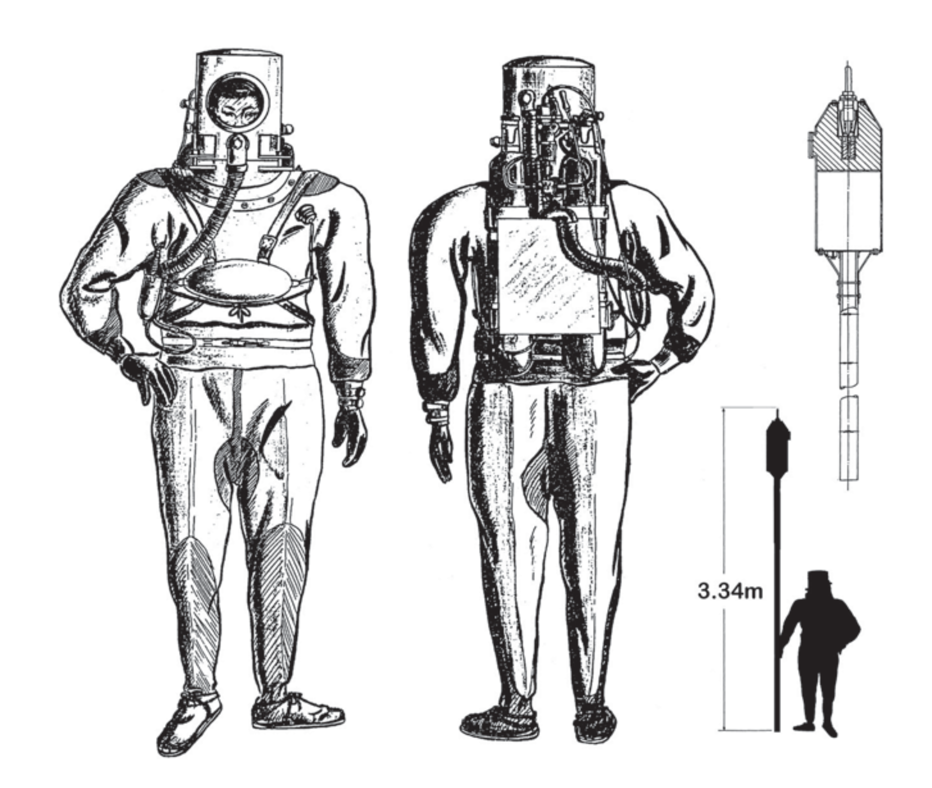
The Shinyo crash boats were deployed, where possible, in small coastal tunnels. The construction of these tunnels varied, with some using wooden internal structures and others using concrete or concrete-block construction as seen here. The tunnels were usually designed to accommodate two or three crash boats. The structure was intentionally small, both to make the sites less conspicuous and to require a minimum of construction material. The boats were mounted on small, two-wheel trailers, which permitted their deployment by a small number of men.

IJN *tokko* assault groups in western Japan, July 1945					
Unit	**Location**	**Shinyo**	**Renraku-tai**	**Kaiten**	**Koryu/Kairyu**
	Kyushu				
32 AG	Kagoshima Bay	500	200		12
Kawatana AG	Nagasaki	200	100		
31 AG	Goto Archipelago	50		4	
34 AG	Fukuoka	25	100		
24 AG	Saiki				12
35 AG	Hyuga Sea	125	100	2	
33 AG	Shibushi Bay	100	200	34	12
101/102 AG	Bungo Strait				18
	Shikoku				
21 AG	Sukumo Bay	50		8	12
23 AG	Tosa Bay	175		24	
	Honshu				
36 AG	Tsushima Strait				2
22 AG	Kii Strait	24		4	50
Subtotal (deployed)		*1,249*	*700*	*76*	*118*
Total (including reserve)		**2,150**	**700**	**119**	**125**
AG= Assault Group					

supposed to number 6,000 frogmen and to be ready for combat by October 1945. The primary Fukuryu weapon was the Type 5 Attack Mine, which was a 22lb (10kg) explosive charge on the end of a long pole fitted with a contact fuse. The standard tactic was to deploy the Fukuryu swimmers underwater where a landing was expected to take place. A typical defense position would start with a row of contact mines, tethered to the sea floor at a depth of 11–16.4yds (10–15m), which would be released by the Fukuryu frogmen to bob to the surface at the appropriate moment. Closer to shore were three rows of Fukuryu frogmen with the rows 65.6yds (60m) apart, and the



The Kairyu (Sea Dragon) was a small, 2-man *tokko* submarine and could either carry two torpedoes externally or be fitted with an explosive contact charge in the bow. It was inexpensively made, being powered by an Isuzu automobile engine. These examples are seen in Yokosuka harbor where 207 were built. (NARA)



This wartime US Navy intelligence drawing shows the configuration of the Fukuryu frogman and his underwater breathing apparatus. The inset drawing to the right shows a cross section of the Type 5 attack mine; the upper half contains the 22lb (10kg) explosive charge while the lower part is a hollow float chamber. Below is a silhouette drawing showing the relative size of the Fukuryu frogman with his anti-craft lunge mine. (NARA)

frogmen in a line 54.7yds (50m) from each other. By staggering the rows, there would be a maximum gap only of 21.9yds (20m) for the approaching landing craft. The intention was to deploy these forces in water about 4.4–6.6yds (4–6m) deep. The swimmers would thrust their Type 5 mines against the bottom of landing craft as they approached overhead, sinking them. Behind the Fukuryu frogmen and closer to shore was a row of magnetic mines at a depth of 3.3yds (3m), and finally contact mines starting at a depth of 3ft (91cm). A variety of experiments were conducted to create "underwater foxholes" using concrete pipe or pre-fabricated concrete shelters to help shelter the Fukuryu frogmen from any American countermeasures as well as to protect them from the blasts of nearby frogmen when they set off their lunge mines. The organization of the Fukuryu was based on a section of six frogmen, with five sections per platoon, five platoons per company and three companies per battalion. The first Fukuryu unit was the 71st Totsugekitai Arashi (Special Attack Unit) raised in Yokusuka in the summer of 1945, starting with two battalions with a further four in training. Eventually, this formation was expected to deploy about 4,000 frogmen primarily in the defense of Tokyo harbor and the nearby Honshu invasion beaches. The 81st Arashi at Kure and the Kawatana Arashi at Sasebo were intended to deploy 1,000 divers each. The IJN staff was very keen on the idea and wanted to deploy 40,000 frogmen for the Ketsu-Go, but this was constrained by the lack of underwater equipment.

A more elaborate scheme to defend major harbors such as Tokyo with underwater pillboxes was also under way. As a preliminary plan, some inoperative merchant ships were modified with airtight compartments and oxygen supplies and armed with torpedo tubes. The ships were sunk and the water drained from the compartments. The crew would then transit into the pillboxes using the diving suits, and would occupy the underwater batteries for a ten-day period. They could be deployed either with lunge mines, or with



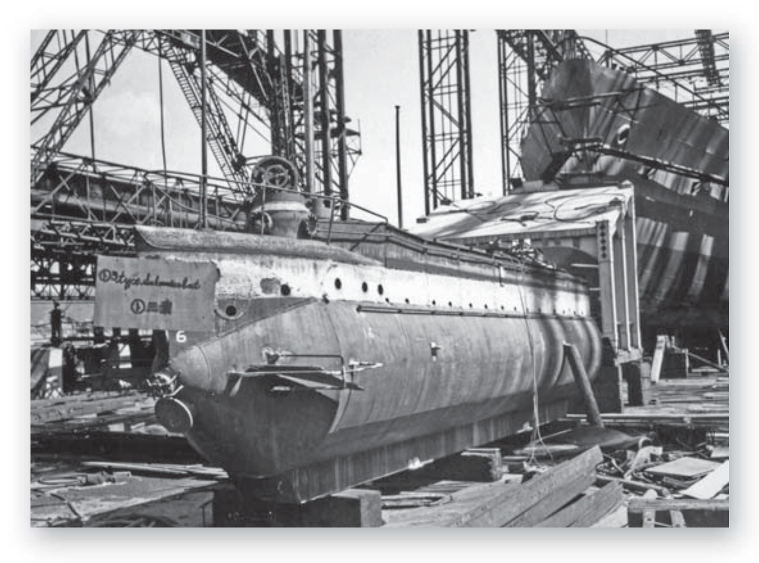
One of the more unusual IJN coastal defense initiatives was the submersible gun program. This illustration shows the Type 1, a type of submersible buoy with a 37mm gun on top. This two-man device would be anchored underwater until the American amphibious attack, then suddenly surface and fire on the approaching landing craft. (Author)

a large limpet mine for attacking American transport ships farther from the shore. There were reports that the 71st Arashi deployed three of these pillboxes at the mouth of Tokyo Bay but other Japanese officers denied that they had been completed before war's end.

The Army was also sponsoring a variety of other unconventional weapons for shore defense. The 10th Military Experimental Station at Murotsu was assigned to study a variety of new beach-defense tactics and weapons including the "submersible gun." The Submersible Gun Mount Model 1 was a pressure-tight steel buoy anchored to the sea floor that could rise up or submerge itself underwater using external ballast tanks. It was armed with either a 20mm Type 98 automatic cannon and 200 rounds of ammunition, or a 37mm Type 4 pedestal gun with 60 rounds. The crew consisted of two frogmen who could live inside the submerged buoy for up to 48 hours, or on the surface for a week. As the American landing craft approached the beach, a formation of these gun-buoys would suddenly pop up from the seabed and begin firing on the landing craft. Two of these were built and tested by May 1945. This was followed in May 1945 by the more elaborate Type 2, which was an elementary submarine based on a simple cylindrical hull containing a small 15hp power plant to power the compressors and water pumps to enable the device to surface and submerge, and to charge the 10hp electric motor. It had a crew of two or three and a maximum speed of 3 knots (5.5km/h) on the surface and 2 knots (3.7km/h) underwater. The Type 2 was armed with a more powerful 7.5cm small-craft gun. A prototype was constructed by Mitsui Shipbuilding Co. in Tamano in July 1944 but initial trials disclosed numerous problems. These

had been satisfactorily resolved as demonstrated during trials off Katsurajima on August 8 and the weapon was ready for production at the time the war ended.

These submersible guns would be supported by the Submersible Pillbox Model 3. This was a larger version of the Type 2 but it was designed to carry and deposit 115 small 11lb (5kg) floating mines as well as to resupply the submersible guns. A prototype was completed by Mitsubishi in Nagasaki in mid-July 1945 and tested in the harbor through August 9, 1945.

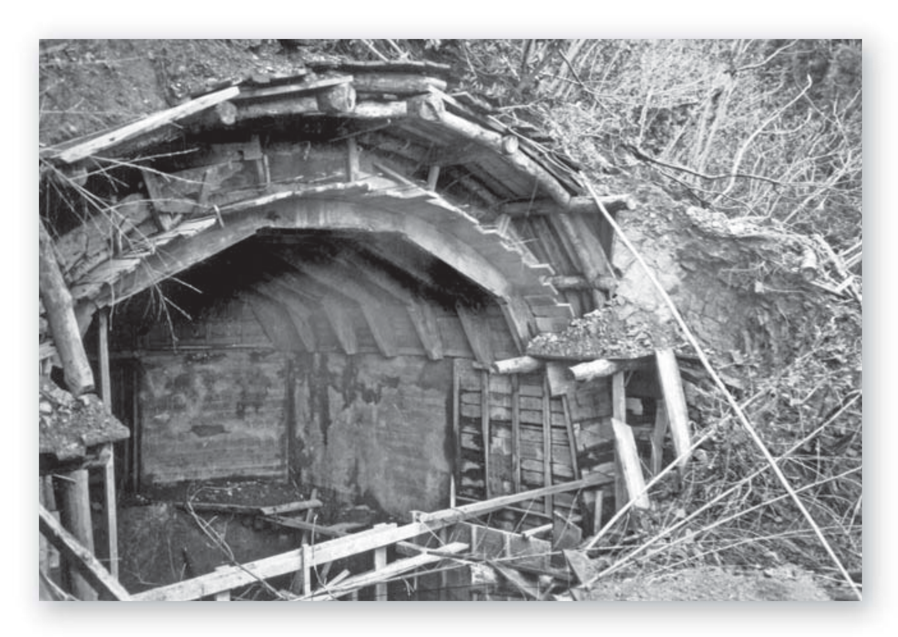

This is the prototype of the Type 3 Submersible Pillbox in the Mitsubishi yard in Nagasaki. Contrary to its name, it was intended to supply the underwater gun positions. The structure on top of the hull contained coastal mines while the similar but smaller Type 2 Submersible Gun mounted a 7cm gun. (NARA)

Defense of Kyushu

Japanese intelligence anticipated that Kyushu would be the most likely location for the initial American amphibious landing, and so defensive efforts were most extensive there. The defense of Kyushu was the responsibility of the 16th Area Army and by the summer of 1945 it included two armies, 15 divisions, seven independent mixed brigades, three tank brigades, and two fortresses. Owing to the importance of Kyushu, a subsidiary operational plan codenamed Mutsu-Go was developed, which outlined the tactical objectives of the various forces available on Kyushu.

Owing to its priority, the defensive work on Kyushu was scheduled to be completed toward the end of May or early June in southern Kyushu and by the end of July on the rest of the island. In fact, a lack of resources delayed the fortification effort and when the commander of the 2nd General Army, Field Marshal Shunroku Hata, and his staff conducted a survey in late June and early July they found that defenses at Ariake Bay, one of the likely landing sites, were only about a third complete, and less so in other critical sectors. The resources available for the fortification program were quite modest and included 21,200metric tons of concrete and 1,000 metric tons of steel for the


The defenses of Kyushu were heavily reinforced for Ketsu-Go. This gun position was constructed near Ibusuki, which controlled access to Kagoshima Bay. (NARA)



The severe shortage of concrete and reinforcing steel led to widespread use of caves and tunnels in Japanese coastal defense. This is a good example of a cliffside gun position being constructed in the Yugawa area of Fukuoka prefecture on norther Kyushu in 1945. (NARA)

peak construction months of April–June 1945. To put this in some perspective, the German Atlantikwall program during its peak construction months of April–June 1943 consumed 2.02 million metric tons of concrete, a hundred times greater than the Kyushu program in a comparable period of time. Furthermore, the German construction program lasted almost three years, consuming about 16 million metric tons of concrete; the Japanese program lasted only a few months. Owing to the shortages of concrete and reinforcing rod, the Japanese fortification program focused on the use of caves and tunnels, and Kyushu was allotted 3.4 million cubic feet (96,300m^3) of lumber for tunneling and field fortifications. One of the IJAs most significant shortfalls in the summer of 1945 was inadequate ammunition stocks in the Home Islands, since so much had been shipped overseas.

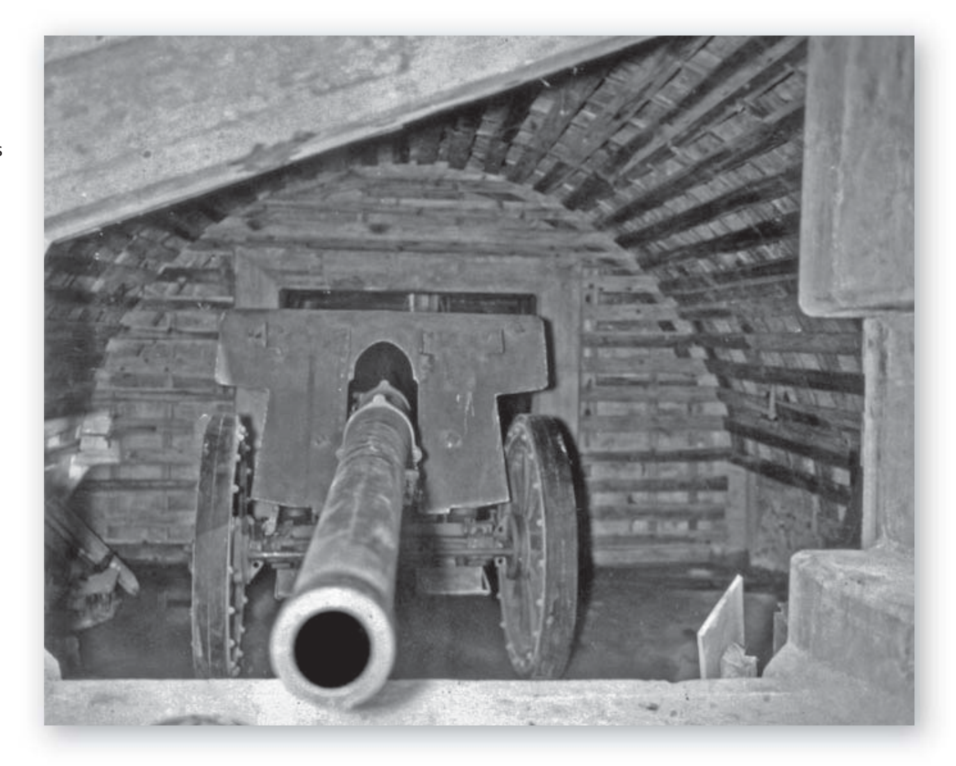
The Japanese success in reinforcing Kyushu in the spring and summer of 1945 had ominous implications for Operation *Olympic*, the US amphibious assault against southern Kyushu scheduled for November 1, 1945. The original *Olympic* plan had been approved in April 1945 at a point when US intelligence



A 14cm Type 3 (1914) gun, part of a battery of seven, which covered Shibushi and Ariake Bay on the southeast corner of Kyushu, the intended landing area of XI Corps for Operation *Olympic*. (NARA)

Defense of Kyushu, August 1945





Although much of the coastal artillery consisted of fixed pedestal guns, field artillery was used to reinforce the coastal defenses in 1945. This is a 10cm Type 92 (1932) gun in a concrete shelter on Biro-jima off the eastern Kyushu coast. (NARA)

believed that Japanese strength on invasion day would be six divisions and a total Japanese force of 229,000 men. A reassessment in July 1945 came to the alarming conclusion that US force advantages were falling from 3:1 to 1:1, which was likely to lead to extremely high American casualties. The actual Japanese strength on Kyushu in July 1945 had tripled to 657,000 men and more than 17 division equivalents. In addition, there were about 300,000 men in the 17 to 44-year-old age group not already in uniform who would have been recruited into the National Volunteer Force, as well as comparable or larger numbers of women.



Owing to the mountainous conditions on Kyushu, Japanese armored strength was limited. Three armored brigades were committed to the 16th Area Army as counterattack forces, and these are Type 3 Chi-Nu medium tanks from the 4th Armored Brigade near Fukuoka at the end of the war, the best Japanese tank in widespread distribution in 1945. (NARA)

THE SITES IN BATTLE

The US plan in the spring of 1945 was to launch a two-pronged assault on the Home Islands. The first amphibious landing, Operation *Olympic*, would hit southern Kyushu on "X-Day," November 1, 1945 with 14 divisions. This would have been the largest amphibious operation of the war; D-Day in Normandy involved 12 divisions. Once southern Kyushu was secure and forward airbases were in operation, the next stage was Operation *Coronet*, landing 25 divisions on the Kanto Plain around Tokyo on "Y-Day," March 1, 1946. An internal US Marine Corps Intelligence Activity study done in the 1990s on the 50th anniversary of the end of the war concluded that: "If Operation *Olympic* had been executed as planned on November 1, 1945, it would have been the largest bloodbath in American history." Estimates of likely casualties vary widely and are controversial; a study by the staff of the US Secretary of War Henry Stimson estimated between 1.7 and 4 million US casualties including 400,000–800,000 dead, more casualties than the US had suffered in the previous four years of war. Potential Japanese casualties were estimated to be in the 5–10 million range on the assumption that there would be widespread civilian participation in the hostilities. In the event, this Armageddon was averted. The US Army Air Force dropped atomic bombs on Hiroshima and Nagasaki and the Red Army invaded Manchuria in August 1945. This double blow gave the Emperor a pretext to surrender even though most of the senior military leadership still hoped to conduct the final decisive battle of Ketsu-Go. The defensive infrastructure of the Home Islands was never put to the ultimate test, but elements of the defenses were subjected to trial in the months leading up to the war's end.

A rain of ruin: Japanese strategic air defense in 1944–45

One of Japan's greatest failures in World War II was the lack of adequate air defenses to shield the Home Islands from bomber attack. Operation *Matterhorn*, the initial campaign by the XX Bomber Command from forward bases in China, began on June 15, 1944 with a B-29 raid against the Yawata steelworks on Kyushu. The bombers were intercepted by Ki-45 Toryu heavy fighters of the 4th Air Regiment, which claimed seven kills; actual combat losses were only one. The performance of the 131st AA Regiment was so poor that its commander was transferred to Manchuria. The Japanese minimum objective for air defense was that half of any bomber force must be shot down; the Yawata mission fell far short of this goal even with the exaggerated kill claims.



Ki-100-I-Ko fighters of the 59th Regiment at Mushiroda airbase in northern Kyushu. This experienced unit had fought in New Guinea until February 1944 when it was withdrawn to Japan for homeland air-defense missions with this new fighter type. (NARA)



The principal night fighter in the Tokyo area was the Kawasaki Ki-45 Toryu (Dragon Slayer) heavy fighter flown by the 4th and 53rd Regiments. Seen at Oppama airbase south of Yokusuka is this Ki-45kai-C, the anti-B-29 version armed with a pair of 20mm Ho-5 automatic cannon mounted behind the pilot's cockpit and firing obliquely upward. (NARA)

The situation did not significantly improve through the summer in spite of enhanced tactics and equipment. On July 19, 1944, the Navy's air-defense fighter units at Yokusuka, Kure, and Sasebo were put under the General Defense Command, and the three Army air brigades assigned to homeland defense were expanded to divisions. A central problem was the inadequacy of the early warning network. The Type A radars were useless, and the Type B radars could detect incoming raids from a range of only 185 miles (300km). Since the radars were seldom more than 93 miles (150km) in front of the targets and the B-29 bombers approached at 280mph (450km/h), the early warning network could seldom alert the fighter units more than an hour before the raid. Typically it took three minutes from the time the radar detected the bombers to the time that air-defense units were alerted and another seven minutes for the local commands to order the fighters to take off. While the first fighter could take off and climb to the B-29's cruising altitude of 10,900yds (10,000m) in about 40 minutes, a section took 50 minutes, a flight took an hour, and a division took 75–85 minutes. As a result, most B-29 missions were attacked by only a handful of fighters. The B-29 was fully pressurized and designed to operate at high altitude; the Japanese fighters were not designed for high-altitude operation. The B-29 enjoyed a speed advantage over many Japanese fighter types at high altitude with a cruise speed of 355mph (570km/h) compared with only 340mph (547km/h) for the Ki-45 Nick.



The most active of the Navy's fighter squadrons in homeland defense was the 302nd Air Group based near Yokosuka. This shows one of its J2M3 Raiden fighters near a hardened aircraft shelter at Atsugi Naval Airbase. (NARA)

The Navy's 22nd Picket Squadron originally had a screen of boats 600 miles (965km) offshore, but depredations by US submarines forced the Navy to pull these closer to home waters in 1944; furthermore, their lack of radar hampered their ability to spot the high-flying bomber formations. The Eastern Army Command set up the 1st Surface Warning Unit with a radar-equipped picket boat off the eastern Japanese coast late in 1944. The radar never worked well at sea and the picket boat was sunk in March 1945. A more useful innovation was the creation of three special air signals intelligence units attached to the air divisions, consisting of fluent English speakers. They listened in on US radio chatter from the Marianas and were often able to determine when an air raid was imminent. However, these units were seldom capable of determining the precise target.

The performance of Japanese antiaircraft artillery batteries was poor. The 7cm gun was largely ineffective against targets at altitudes above 4,900yds (4,500m), and the 8cm could barely reach the B-29 bombers. The first wide-scale distribution of the 12cm antiaircraft gun did not begin until November 1944.

The US XX Bomber Command had its own share of problems, as it was difficult to operate out of the remote Chinese bases and precision bombing from high altitudes proved to be a far greater challenge than expected owing to the jet stream, so bombing accuracy was appallingly bad. The slow tempo of US bombing raids changed on November 24, 1944 when the XXI Bomber Command began to stage raids from the closer Marianas.

With a growing trend toward suicide tactics, the first aerial ramming attack took place on August 7, 1944. The 10th Air Division in the Tokyo area set up a To-Go unit (Tokubetsu Kogeki Tai, or Special Attack Unit) in October 1944 and their missions were successful enough that all units except for the 17th and 18th Air Regiments were instructed to assign three or four of their planes to a special To-Go unit, also called a Shinten (Sky Quake) unit in some districts. A US assessment counted nine B-29s destroyed and 13 damaged by ramming for the loss of 21 Japanese fighters.

Attempts were made to establish a ground-control intercept system using early warning radars such as the Tachi 6 or Tachi 18 in a pair, with one radar tracking the bombers and the other the fighters. However, the radars were not accurate enough and the best results obtained were a final separation of six miles (10km). This network was inferior to that used by the RAF during the Battle of Britain five years earlier.

The first firebomb raids against Tokyo on November 30 prompted another wave of improvements. The Navy strengthened its air-defense forces from about 140 fighters in June 1944 to 630 by the war's end. These fighter units were limited to actions near their bases, so only the 302nd Naval Air Group based near Tokyo saw considerable fighting against B-29s. The supply of new 12cm guns was concentrated in the Tokyo region and by the war's end some 84 had been deployed – the entire 1942–44 production run. Aided by a disproportionate share of radars, this division would finally begin to score more kills by the spring of 1945. The heaviest air-to-air fighting took place from November 1944 to February 1945.

In mid-February 1945 the air-defense situation took another turn for the worse when the US Navy's Task Force 58 appeared off the Japanese coast and began to stage carrier air raids. These missions were directed against Japanese airfields on the Kanto Plain near Tokyo. In all, US fighters claimed 341 Japanese aircraft in the air and 190 on the ground, and acknowledged

losing 60 in aerial combat or to antiaircraft fire. The gradual collapse of the Japanese war economy also impacted AAA ammunition supply, and, instead of the usual unit of fire of 200 rounds per gun, this fell to only 30 to 40 rounds with admonitions to minimize use.

While the GDC was trying to come to grips with high-altitude B-29 tactics, the USAAF XXI Bomber Command was attempting to overcome the poor accuracy of the bombing raids to date. Analysts were convinced that the Japanese air defense force was so weak that the USAAF should abandon daylight high-altitude tactics and switch to low-altitude night firebomb attacks on major cities since the lack of radar-equipped night fighters and the poor quality of Japanese fire-control radar would limit the Japanese response. The first of these new night raids was launched at midnight on March 9, 1945. The mission started a firestorm in eastern Tokyo, destroyed nearly half the city, and left about 85,000 dead. The 10th Air Division ordered all of its 90 night fighters into action and claimed 15 B-29 bombers; US accounts do not acknowledge any losses to fighters but indicate that seven were lost to unknown causes. The 1st AAA Division claimed 18 B-29s shot down and 66 damaged; US records indicate one was shot down by flak. Scapegoats were needed so most of 10th Air Division's senior commanders were sacked or reassigned. Osaka and Kobe were hit days later, but remaining Japanese cities enjoyed a temporary respite in late March when the B-29 missions were temporarily shifted to attack kamikaze airbases on Kyushu because of the heavy casualties they were causing the US Navy during operations around Okinawa.

The gravity of the situation in April 1945, as well as the imperial approval for the Ketsu-Go plan, forced the IJA and IJN to overcome their usual rivalries and unify the air units in the Home Islands under a new Air General Army on April 15, 1945 under General Masakazu Kawabe. In spite of the attempts at unification, the new command faced savage attrition of its fighter force both owing to combat against US aircraft as well as a crippling accident rate when inexperienced pilots were committed to night and high-altitude operations. The Navy's one technological contribution to the night air battles was the deployment of the first radar-equipped night fighters, the J1N3 Gekko (Irving) with the new FD-2 airborne intercept radar. The radar's performance was disappointing and most units ended up removing them to gain additional speed.

In April 1945, the USAAF began escorting the B-29 bombers with P-51 Mustang fighters based on Iwo Jima. By this stage the quality of Japanese pilots had dropped so precipitously and the threat of American fighters had grown so great that the GDC decided against vigorously contesting the American air raids and opted for a policy of conserving fighter aircraft for the final Ketsu-Go battles. When Task Force 38 launched surprise carrier air strikes on July 10 they were met with hardly any aerial opposition, in contrast to the hornet's nest that had greeted Task Force 58 in March.

The 10th Air Division, responsible for Tokyo and the Kanto Plain, had been reduced from about 400 fighters in the summer of 1944 to only 95 fighters by July 1945; the 11th Air Division in the central district of Honshu was reduced from 200 fighters to only 130. During the war, B-29 gunners claimed 914 Japanese fighters shot down, 456 probably destroyed, and 770 damaged. While B-29 claims were overstated, the Japanese fighter force suffered heavy losses. Japanese accounts indicate that 4,000 fighters were lost in the defense of Japan including 1,450 in combat and 2,750 from non-combat causes. In total, the US counted 11,026 Japanese fighter attacks against

the B-29. No precise totals for air victories by the IJAAF and IJN are known, though IJAAF fighter pilots claimed at least 470 B-29s. The most active of the Navy units, the 302nd Air Group, claimed 300 kills against B-29s and other US aircraft, both of which were gross exaggerations.

The performance of the AAA divisions was generally poor due to inadequate equipment. The only division to make extensive claims against the B-29s was the 1st AAA Division stationed in the Kanto area around Tokyo, which claimed 193 B-29 bombers shot down and 454 damaged during the course of the war; this was a significant overstatement. Of the other three divisions, the 2nd AAA Division claimed 10 B-29s shot down and 323 damaged while the other two divisions scored few victories and made no detailed claims.

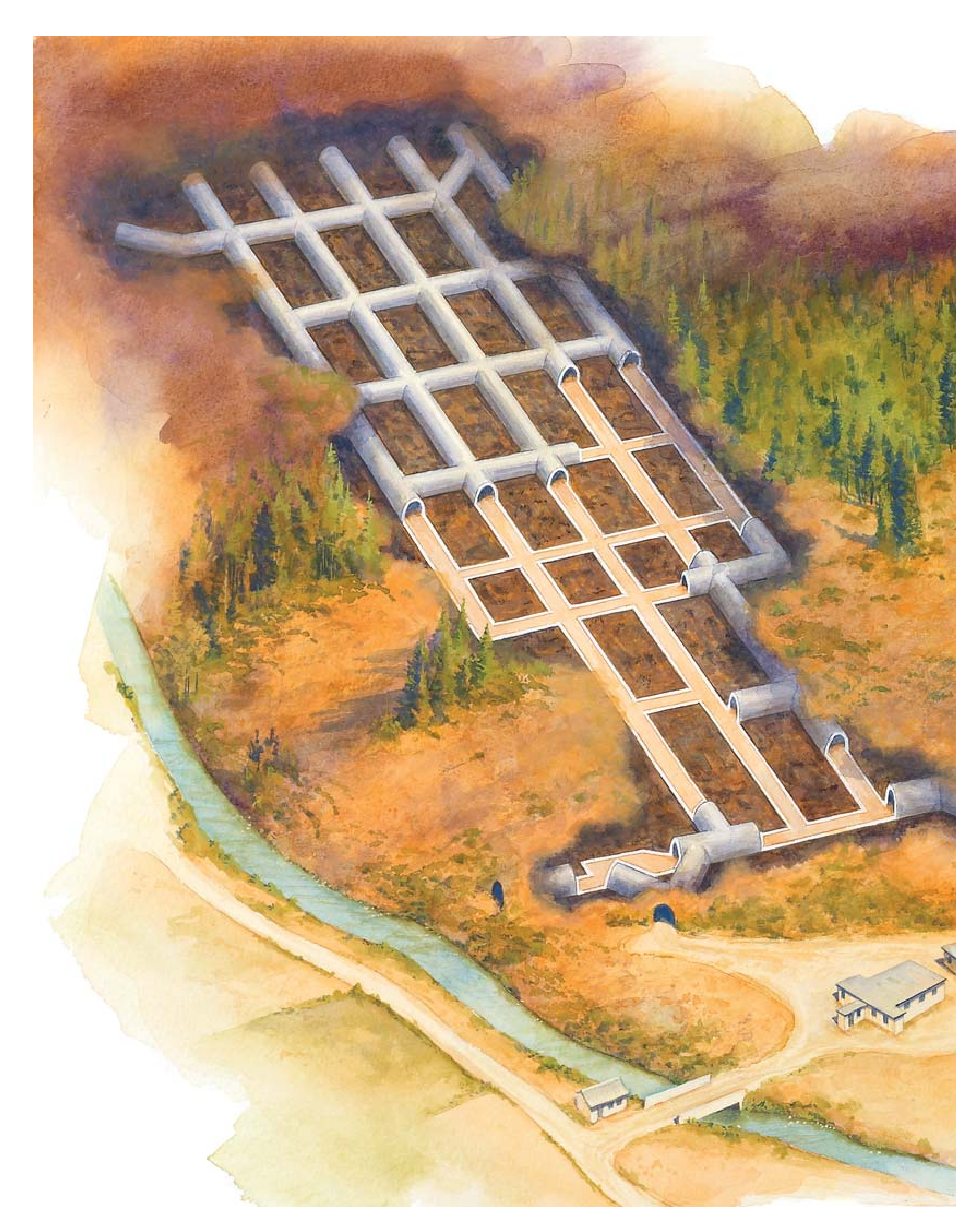
B-29s versus Japanese air defenses, June 1944 to August 1945

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan 1945	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
Japanese fighter strength	260	320	370	355	375	375	370	375	385	370	450	480	485	500	535	6,005
B-29 sorties	166	114	171	217	310	611	930	1,009	1,331	3,013	3,487	4,562	5,581	6,464	3,331	31,297
IJAAF B-29 claims	4		15	5			67	39	36	77	108	64	54			469
B-29 losses to fighters	1	1	3	1	1	9	8	13	7		13	8	8		1	74
IJAAF flak claims							3	1	6	18	78	73		3	11	193
B-29 losses to flak			1				5			9	11	11	12	2	3	54
B-29 losses to fighters and flak								2			9	4	2	2		19
B-29 claims against fighters		18	19	21	37	55	59	144	72	15	202	131	136	3	2	914

G FOLLOWING PAGE: MATSUSHIRO IMPERIAL HEADQUARTERS

As part of a program to disperse the main government headquarters from Tokyo, in November 1944 the Army began construction on a complex of tunnels in the mountains near the village of Matsushiro, a suburb of Nagano, under the cover-name of the "Matsushiro Warehouse Complex." This complex was designed to house the main military and civil authorities for a last-ditch defense of Japan even if Tokyo was captured. This new underground capital consisted of several tunnel complexes including the Army headquarters under Mount Maizuru, a communication hub for Japan Broadcasting Corporation (NHK), the central telephone office under Mount Zozan, and a smaller communication center under Mount Saijo. In March 1945, the Army secretly decided to create an alternate imperial residence under Mount Minikami along with a sanctuary for the imperial regalia at Mount Kobo. A special armored train was created to transfer the imperial family to the complex, operated by a special armored company of the 1st Guards Division. The Matsushiro tunnel complex was carved out of solid rock in order to be impervious to the heaviest American bombs, which were presumed to be comparable to the British Tallboy bombs dropped on German targets in 1944–45. Numerous tunnel entrances were constructed so that if one opening was bombed alternates would be available. About 2 million cubic feet (56,633m^3) of rock was excavated for the 6.5 miles (10.4km) of tunnels, and about three-quarters of the complex was completed before the war ended at a cost of about ¥200 million ($75 million). Most of the heavy labor was undertaken by 7,000 Korean forced laborers, of whom about 1,500 died because of the primitive working conditions.

When he learned of the Army's plans Emperor Hirohito refused to move to Matsushiro, realizing it would fatally weaken the prestige of the throne and leave him a puppet in the Army's plans for national suicide. After the war, the tunnels were closed and forgotten though eventually a portion of the complex under Mount Zozan was opened up and became a minor tourist attraction. The complex became the source of some political controversy during the Nagano Winter Olympics in 1998 when local peace activists attempted to focus attention on the site and the deaths of so many Korean laborers as a public repudiation of Japan's wartime crimes.







Nagasaki was defended by the 134th AAA Battalion with very modest antiair defenses including 12 7cm, six 8cm, and six 10cm antiaircraft guns. This is one of the 7cm guns overlooking the harbor. (NARA)

Total B-29 losses in 1944–45 were 414 aircraft, of which USAAF assessed 147 as being due to enemy action. This was a very modest loss rate in view of the large number of bomber sorties. The US 8th Air Force in Europe lost more bombers to Luftwaffe flak and fighters most months in 1944 than total B-29 combat losses in the 15 months of 1944–45.

The causes of the Japanese failure were in large measure due to complacency until the last year of the war, and the declining Japanese technological balance against the United States from 1941 to 1945. By way of comparison, Germany manufactured more heavy flak guns in 1944 alone than Japan produced during the entire war. Flak strength in Germany alone in 1944 was over 7,700 heavy guns compared with only 2,775 guns deployed in Japan in 1945. More importantly, the German guns were primarily in the 88mm to 128mm calibers, which were well suited to combating heavy bombers and with much greater accuracy owing to more modern fire controls. Japan had fewer than 200 guns over 100mm in caliber and able to reach the B-29 when it was operating at 10,900yds (10,000m).

The two atomic bomb strikes in August 1945 were not resisted by either Japanese fighters or antiaircraft guns. By the summer of 1945 Japanese air defenses had grown accustomed to overflights by single B-29s on



The 10cm Type 98 twin antiaircraft gun was usually emplaced in a deep gun pit, like this example at Muroran in southern Hokkaido. These batteries saw little action against the marauding battleships of Task Force 38 in the summer of 1945 since they were out of range, but they were used for antiaircraft purposes. (NARA)

reconnaissance missions, and generally avoided intercept missions in order to conserve fuel. Hiroshima was defended by five 7cm and 8cm gun batteries of the 3rd AAA Division, including units from the 121st and 122nd AA Regiments and the 22nd and 45th Separate AA Battalions. Nagasaki was defended by the 134th AAA Regiment of the 4th AAA Division with four 7cm batteries and two searchlight companies. During the nuclear attack on August 9 the regiment suffered 223 casualties including 36 killed.

Japanese coastal artillery

There were numerous instances of gun duels between Japanese coastal artillery on the Pacific islands and US Navy ships, most often involving destroyers armed with 5in. guns, which put them in range of similarly armed Japanese shore batteries. However, coastal artillery in the Home Islands saw little or no combat use. In July 1945, the battleships of Task Force 38 bombarded several Japanese industrial sites along the coast, several of which had coastal gun batteries. These shore batteries were unable to contest the battleship bombardments since they lacked the range. The ineffectiveness of the coastal gun batteries in these incidents suggest that Japan was prudent in not committing too many resources to this archaic form of defense.

THE SITES TODAY

Japan has made little effort to preserve the remains of the 1945 defense works. The Japanese armed forces attempted to comply with US demilitarization instructions before the arrival of US occupation forces in September 1945. As a result, most coastal artillery and antiaircraft sites had their weapons removed and brought to central depots for eventual destruction. The exception were the large, fixed weapons and some gun batteries in more remote locations, which were demilitarized in late 1945 and early 1946.

In recent years, there has been growing interest in preserving Japanese war artifacts, supported by a curious mix of military buffs and Japanese peace activists with very different motivations. Some see preservation as a means to highlight Japan's military traditions and the sacrifices of the wartime generation; others see preservation as a means to recall Japan's wartime crimes. A few gun batteries have survived on some of the more remote islands but are rusty and in disrepair. A handful of guns evaded the scrapheap and have been preserved. The Nasu War Museum has one of the old 28cm howitzers on display, and the Yasakuni Shrine in Tokyo has many artifacts relating to the 1945 period including a 14cm coastal gun. The surviving elements of Japan's extensive prewar coastal fortification system are detailed in David Kirchner's excellent series of articles in the *Coast Defense Study Group Journal*. There are numerous gun caves and pillboxes scattered along the Japanese coast minus their weapons, and there are numerous extant examples of the reinforced concrete aircraft shelters. A number of underground factory caverns have survived, and there are also a number of civil defense caverns and bunkers; some are minor tourist attractions. Likewise, some of the major headquarters bunkers have survived including the Imperial HQ Nagano complex, the Navy HQ at Hiyoshidai, and the GHQ at Matsumoto. The kamikaze craft have attracted enduring attention and curiosity, so not surprisingly many artifacts survive including Kaiten submarines and Ohka aircraft at museums around the world. Battlefield archeology has attracted more attention in recent years, and several of the Japanese-language books listed below are guides to the surviving structures

and artifacts in Japan; the Motoyuki, Takeuchi, and Yasujima books listed below include listings and maps to many of the surviving sites.

FURTHER READING

The focus of most English-language books on Japan in 1945 has been the US decision to use the atomic bombs. Operation *Downfall* and its associated *Coronet* and *Olympic* amphibious landings have also been widely described, as has the B-29 bombing campaign. These are very helpful in understanding the context of the defensive infrastructure described in this book, and I highly recommend Richard Franks' book as the contemporary standard on these controversial issues. For readers interested in "what might have been," there are a number of fictional accounts of the US invasion of Japan including Dominick Ricca's *The 1945 American Invasion of Japan* (XLibris: 2006), Robert Conroy's *1945* (Ballantine: 2007) and David Westheimer's *Lighter than a Feather* (Little, Brown: 1971).

Although Japanese defensive preparations have not been extensively detailed in English-language books, there is a surprisingly rich assortment of reports and studies done for the United States War Department immediately after the war. The Japanese military deliberately destroyed most of its military records in the interval between the surrender and the start of the US occupation. However, the US Demobilization Bureau at the bequest of the G-2, GHQ, and other organizations attempted to recreate an account of the war from the Japanese perspective. One outcome of this process was the "Japanese Monograph" series that was later taken over by the Military History Section of HQ, Army Forces Far East. These studies were prepared by senior Japanese officers and roughly correspond to the better-known "Foreign Military Studies" series done by German commanders after the war. The Japanese Monographs differ considerably in quality and depth and the titles are sometimes misleading or incomplete. For example, the four *Homeland Antiaircraft Defense Operations Record* volumes are in fact histories of the four antiaircraft divisions. The two parts of Volume II of the *Reports of General MacArthur* are another outcome of the postwar historical reconstruction process by the Japanese under American auspices and the second part contains extensive details on the Ketsu-Go plan. Besides the studies done by Japanese officers for the US military, there were a number of efforts to document Japanese military activities by the US armed forces. The two USAFPAC surveys on Japanese coastal artillery and antiaircraft artillery are extremely detailed and useful. The US Naval Technical Mission to Japan series is more narrowly focused, but contains some real gems dealing with coastal defense issues. The US Strategic Bombing Survey (USSBS) focused primarily on the effects of air attacks, but also did important work on passive air defense and on the aviation industry. I located most of these documents at the US National Archives and Records Administration (NARA II) in College Park, Maryland and the US Army Military History Institute at Carlisle Barracks, Pennsylvania.

Japanese Monographs

Homeland Operations Record (No.17)
Homeland Operations Record Volume IV, Fifth Area Army, Late 1943–1945 (No.21)
Air Defense of the Homeland, 1944–1945 (No.23)
Preparations for Operations in Navy Defense of the Homeland, Plans and Preparations, July 1944–July 1945 (No.85)

5th Air Fleet Operations, February–August 1945 (No.86)
Outline of Third Phase Operations, February 1943–August 1945 (No.117)
Operational History of Naval Communications, December 1941–August 1945 (No.118)
Outline of Operations Prior To the Termination of War and Connected With the Cessation of Hostilities, July–August 1945 (No.119)
Homeland Defense Naval Operations, Part II, March 1943–August 1945 (No.123)
Homeland Defense Naval Operations, Part III, June 1944–August 1945 (No.124)
Homeland Operations Record, Volume IV, Operations In Karafuto and Christina Area, 9 August–22 August 1945 (No.153)
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Homeland Antiaircraft Defense Operations Record, Tokai Sector Defense Preparations, December 1944–August 1945 (No.168)
Homeland Antiaircraft Defense Operations Record, Kanto Sector Defense Preparations, June 1944–August 1945 (No.170)
Outline of Naval Armament and Preparations for War Part VI (No.174)
Homeland Antiaircraft Defense Operations Record, Central Sector Defense Preparations, September 1944–July 1945 (No.175)
Homeland Antiaircraft Defense Operations Record, Western Sector Defense Preparations, June 1944–August 1945 (No.176)
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US Naval Technical Mission to Japan Reports

Japanese Land-Based Radar (E-03: 1945)
Japanese Torpedoes and Tubes: Article 1 – Ship and Kaiten Torpedoes (O-01-1, 1946)
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Japanese Naval Mining Organization and Operational Techniques (O-05, 1946)
Japanese Research in Airborne Acoustics and Earthwaves (O-41, 1946)
Effectiveness of Japanese AA Fire (O-44, 1946)
Defenses of Tsushima and Entrance to Sea of Japan (O-55, 1946)
Kyushu Defense Systems: Japanese Field and Amphibious Equipment (O-56, 1946)
Characteristics of Japanese Naval Vessels: Submarines (Supplement II, S-01-7, 1946)
Ship and Related Targets: Japanese Suicide Craft (S-02, 1946)
The Fukuryu Special Harbor Defense and Underwater Attack Unit – Tokyo Bay (S-91, 1946)
Tenth Military Experimental Station (S-93, 1946)
Bomb-proof Construction in Japan (X-31, 1946)

US Strategic Bombing Survey

Summary Report: Pacific War (No.1, 1946)
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Field report covering air-raid protection in Nagasaki (No.5, 1947)
Field report covering air-raid protection in Kyoto (No.6, 1947)
Field report covering air-raid protection in Kobe (No.7, 1947)
Field report covering air-raid protection in Osaka (No.8, 1947)
Summary report covering air-raid protection and allied subjects in Japan (No.10, 1947)
Final report covering air-raid protection and allied subjects in Japan (No.11, 1947)
The Japanese aircraft industry (No.15, 1947)
Underground production of Japanese aircraft (No.35, 1947)

Japanese army ordnance (No.45, 1947)
Japanese air power (No.62, 1947)
Japanese air weapons and tactics (No.63, 1947)
Evaluation of Photographic Intelligence in the Japanese Homeland: Part Nine – Coast and Antiaircraft Artillery (No.107, 1946)
Evaluation of Photographic Intelligence in the Japanese Homeland: Part Seven – Electronics (No.105, 1946)

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Design, technology and history of key fortresses, strategic positions and defensive systems

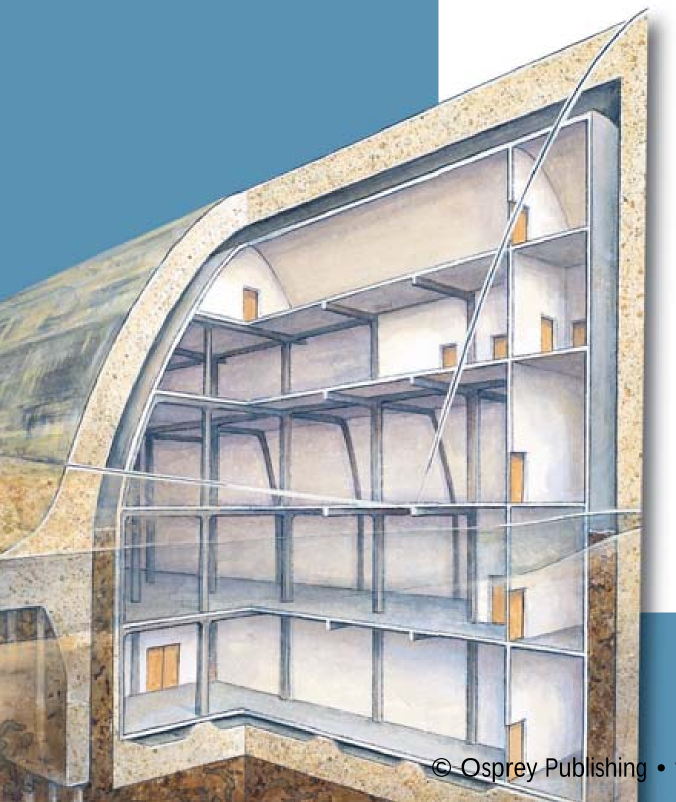




DEFENSE OF JAPAN 1945

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